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Foods

THEIR SELECTION AND PREPARATION

Revised Edition

STANLEY AND CLINE

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Foods : THEIR SELECTION AND PREPARATION

Revised Edition

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By

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and

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Preface

This book has been written mainly for college and university students beginning the study of the selection, preparation, and serving of food. Homemakers and others responsible for meals have been kept in mind. The book is the result of teaching courses in the Selection and Preparation of Food, Food Buying, and Meal Planning and Service at the University of Missouri, and of working with homemakers, home economists, and nutritionists.

Throughout the book an attempt has been made to give an appreciation of both the science and the art involved in providing three meals a day; science, since nutritious meals are essential to good health; and art, since meals must be palatable in order to be eaten. The rapidly developing science of nutrition has shown the relation of food to health. It is determining what nutrients are essential and in what amounts. Also it is determining the effect of storage, processing, and cooking on the retention of the various nutrients. Food preparation is fast becoming a science based on principles derived from carefully controlled experiments. Knowing the why as well as the how in selecting and preparing food is important for good nutrition, palatability, and economy.

The principles developed throughout the book are the result of experimental work and research conducted not only in the laboratories and experimental kitchens of the authors, but also in those of many government agencies, universities, colleges, and food industries. The references at the ends of chapters have been selected mainly because of their availability and general fitness for undergraduate students and homemakers. They are not intended to be inclusive in scope.

The authors wish to express their gratitude to the many who have helped with the various phases of the preparation of this book.

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FOODS:

THEIR SELECTION AND PREPARATION

I · Selection of Food

The selection of food is a responsibility everyone faces. Available supplies, economic factors, likes and dislikes, may limit choice. Within these limits the individual selects his or her daily food from home stores, the market, the family table, or the public restaurant. This should meet individual needs for good nutrition, as well as satisfy hunger and provide emotional and physical satisfaction.

The responsibility for wise selection of food lies heavily on homemakers and persons responsible for group feeding; they limit the choices of those they serve by the food they provide and the way it is prepared. The purpose of this chapter is to emphasize the close relation of food to life and health; to show that abundant health requires not just food but the right food; and to make clear that the right food properly prepared can improve the quality of life as well as increase its length.

Primitive man ate the natural foods available. When food was adequate in kind and amount, the group survived. Inadequate food resulted in low physical development, poor health, and high death rates. Thus, through painful, expensive experiences, racial food habits and appetites were developed and came to be fair guides in the choice of food under simple conditions of living. But racial habits and appetites can no longer be depended upon to guide the choice of food.

So long as families lived in stable communities and produced most of their food, traditional diet patterns were developed that were reasonably safe guides to the choice of food. With the increasing specialization of agricultural production, interest centered in the cash crop to the neglect of food for the family. With increased efficiency in agricultural production, fewer persons were required in agriculture. Many families moved from rural to urban areas to find employment. Under these changed situations, many families were unable to obtain their accustomed foods and were left with no experience to guide their choice of food in the new situation.

Now food production and distribution is highly centralized and commercialized. Many foods must be transported long distances. Some are processed and refined to such a point that they have lost important nutrients which they contained in their natural state. Many families buy all the food they eat; all buy some. Nationwide dietary studies made in 1937 and 1942 indicated that in spite of our abundant supplies of food many families have inadequate diets.

CAUSES OF POOR DIETS

These inadequate diets were shown to result from a combination of causes: low incomes, bad food habits, and lack of knowledge as to the importance of food and what constitutes a good diet.

Low Incomes. Economic factors were most important. Inadequate diets are most likely to occur among low-income groups, but they are not confined to them. Some families in the low-income group were able to obtain good diets by wise expenditure of the food money, and some who made liberal expenditures for food were far from achieving good diets. Adequate income alone is not enough. At all levels there should be education in the importance of food to health and in a rational basis for sound choice of food. Nevertheless an important factor in the improvement of nutrition on a national scale is the maintenance of income levels that make possible the purchase of adequate diets.

Bad Food Habits. We all know individuals and families with pronounced food habits based not on racial or traditional experience but on likes and dislikes largely developed from familiarity and emotional associations with food. Liking a food is partly a matter of knowing it; one tends to like familiar foods. Many persons avoid new foods and new methods of preparation; and the more narrow a person's choice the less likely he is to attain a good diet.

The wise mother introduces her child early to a variety of foods prepared in different ways. Individuals should make special effort to widen their acquaintance with new foods. Trying new foods is as important in building good food habits as meeting new friends is in broadening one's social experience. The circle should not be too narrow in either case.

Psychological factors influence food habits. Too much emphasis on a good food or an association of a food with an unhappy situation may develop a resistance to that food. Giving distasteful medicine in orange juice or milk has built up in some individuals a dislike for these important foods. Psychologists have shown that by unpleasant associations they could consciously condition children against desirable foods. Many families, unconsciously and with the best intentions, produce the same result. Persons who have been so conditioned should set themselves to break any food habits that may interfere with obtaining adequate diets.

When the right food may be had within existing habit patterns it is easy to achieve a good diet. More frequently these habits make wise choice difficult, and the individual or family suffers in health. Certain defects in health are said to run in families, but bad food habits passed on from one generation to another frequently explain these defects.

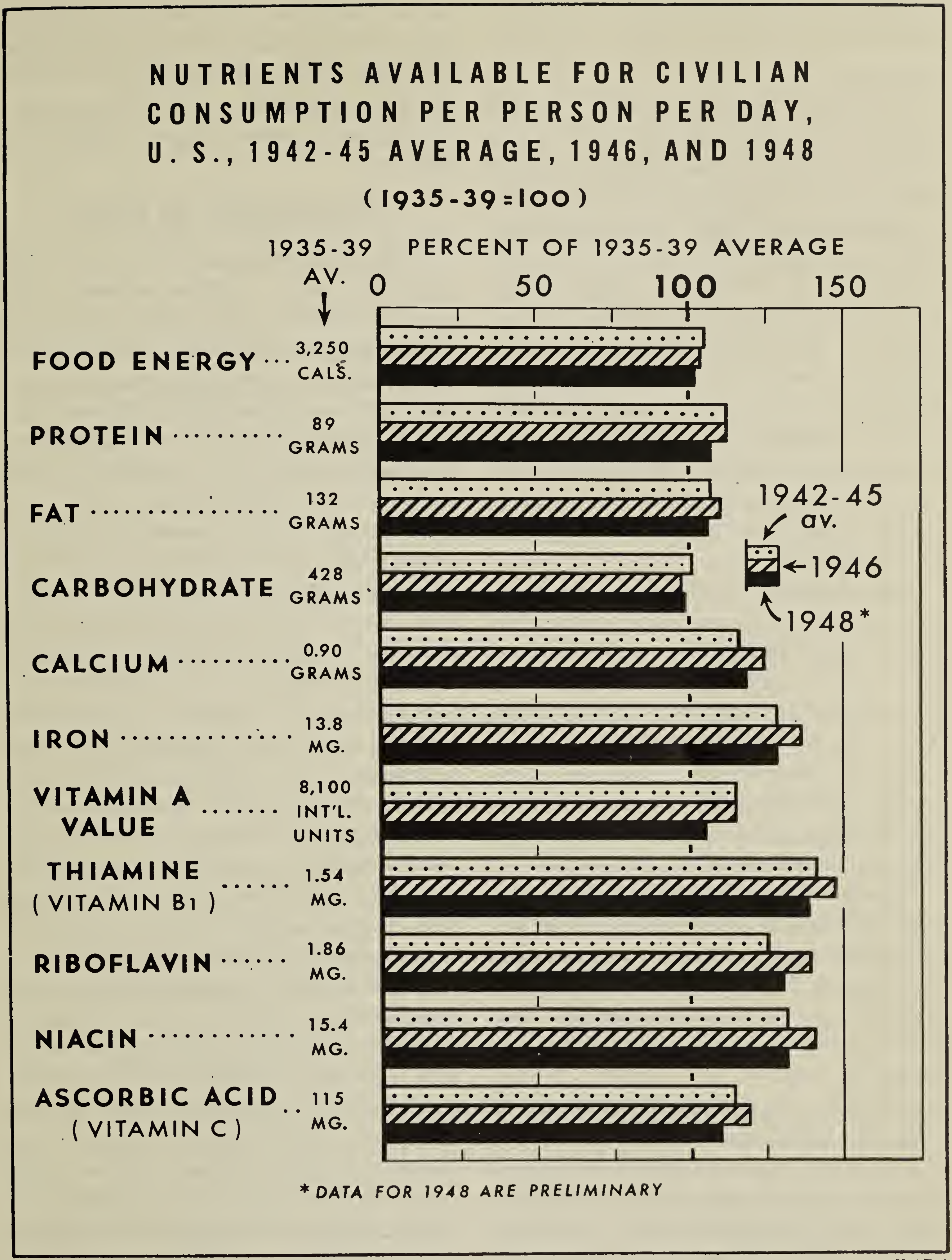
Those who live in regions of the country where incomes generally are low are said to be inefficient and predisposed to certain diseases. This supposed predisposition has been shown to be due, in large part, to bad food habits resulting from economic conditions rather than to any inherited susceptibility to these diseases.

Lack of Knowledge of Nutrition. Many persons form bad food habits because they lack a knowledge of the importance of food and what constitutes a good diet. Such knowledge can be acquired only through education. There is now available a large body of scientific facts concerning nutrition. These facts have been interpreted in everyday terms to serve as guides for good basic food habits and to lead to an appreciation of the importance of such habits. Most racial food habits and traditional diet patterns now can be explained by the findings of the comparatively new science of nutrition. The underlying principles of nutrition furnish a rational basis for food selection to take the place of instinct and appetite.

FUNCTIONS OF FOOD

Food is any material which when eaten is digested, absorbed, and used to build and replace body material or to provide energy.

Source of Energy. Food must supply energy for bodily activity. Some energy is needed in just living, in maintaining those internal functions which run so smoothly that we are scarcely aware of them. Breathing, the beating of the heart, the circulation



U.S.D.A.

Changing Food Habits · Nutrition education helped to change food habits during this period of the blood, all require energy. Energy is needed also to maintain normal body temperature.

To this basic requirement must be added enough energy for conscious physical activity. Sitting, standing, walking, running, working, or playing all require energy in varying amounts. Unless this energy is provided in the food, body tissues are burned to supply it. In reducing diets this consumption of body fat may be desirable provided the diets carry the essential building and regulating foods. But, under normal conditions, the food should supply the daily needs for energy. The amount of energy required varies with the size of the individual, the amount of body surface, the surrounding temperature, and the amount of physical activity.

Body Building. Body tissues and fluids, muscle, bone, blood, and lymph are built and kept in repair from the materials provided by food. Food should supply body-building materials in the right forms and amounts. The demand for body-building foods is greatest during the years of most rapid growth, but there is a basic demand at all ages for building and repair material. In general this demand varies with the weight.

Regulating Body Functions. Under normal conditions, the many complex functions of the body are controlled without conscious interference. Digestion, breathing, and the heartbeat go on continuously without conscious attention on our part. These unconscious activities are controlled by the maintenance of the normal composition of important body tissues and fluids.

The normal water content of the body is important to many functions. The protein must provide the building units for blood and other fluids that control vital organs as well as for muscle and bone. The blood and lymph must contain just the right proteins for building the antibodies that provide protection from disease. Fats and carbohydrates are necessary in small amounts to functioning body cells. Traces of minerals are essential to important body functions. Some vitamins initiate and regulate chemical changes in body fluids.

COMPOSITION OF FOOD

In selecting a meal most individuals do not consciously select protein, minerals, and vitamins. Instead, they think in terms of foods or groups of foods that, combined each day, furnish as nearly as is now known what the body needs for healthful living, or, as we say, an "adequate diet." Knowledge of food composition is necessary to interpret food needs in terms of food groups.

Chemically, foods are composed largely of carbon, hydrogen, and oxygen, the elements making up the greater portion of all organic foods, but in addition they contain many other elements in varying proportions. Nitrogen, sulfur, and phosphorus are additional elements present in proteins. Of the mineral elements, calcium, iron, and iodine have important functions in the body, and agreement has been reached as to the amounts required. Other elements are known to be necessary, and are present in traces in natural foods so as to offer no serious problem of selection when diets are adequate in other respects.

In evaluating foods from the point of view of nutrition, their composition is ordinarily stated in terms of the basic food constituents of similar composition and function in the body. These are carbohydrates, fats, protein, water, and the mineral salts or ash, the portion which would remain if the food were burned. To plan adequate diets we must know the amounts of these constituents in different foods and the function each serves.

Carbohydrates. Carbohydrates are the simplest of the organic food constituents. Carbohydrates include the sugars and the starches. All the food carbohydrates of any importance, except lactose, the sugar in milk, are of plant origin. Carbohydrates contain only the three elements carbon, hydrogen, and oxygen. They burn completely in the body, and in doing so give off energy, yielding carbon dioxide and water.

Fats. Fats also are organic foods composed of carbon, hydrogen, and oxygen. They contain a smaller proportion of oxygen than the carbohydrates. This means that more of the carbon is in an unoxidized form, so that fats are a more concentrated source of energy than carbohydrates. Under normal conditions fats burn completely in the body, yielding carbon dioxide and water. Fats occur naturally in varying amounts in most foods. When in liquid form they are called oils. Solid food fats in relatively pure form, such as butter and lard, are largely of animal origin, and oils are obtained from the seeds of plants. (See page 136.)

Proteins. Proteins are organic compounds containing phosphorus and sulfur in addition to carbon, hydrogen, oxygen, and nitrogen. Proteins are essential in body building as a source of the amino acids, the building stones of proteins. Proteins may burn in the body, yielding energy. They always leave an organic residue containing nitrogen. This residue is excreted in the urine largely as urea.

There are some 22 amino acids present from different sources in varying proportions in the proteins. Only ten of these are essential; the others can be built in the body if the essential amino acids are present in adequate amounts. The possible combinations of amino acids in any one food are so great that as yet any classification of proteins based on amino-acid content is impossible. The efficiency of any protein in tissue building depends upon its amino-acid content. The more nearly the amino-acid content of a food approaches that of the body proteins, the more economically it is used in building body tissues and fluids, or the more efficient it is. The term *high quality* also is used to describe an efficient protein.

Proteins vary in efficiency. Study of individual proteins has been hampered since no natural foods contain only protein or only one protein; most foods contain several proteins combined with other nutrients. Since the first decade of this century rapid advances have been made in the isolation of individual proteins, and in recent years considerable knowledge has been built up as to the amino-acid content of these individual proteins.

But because we eat foods, not separated proteins, emphasis has shifted from the chemical to the biological study of these important nutrients. In biological studies of proteins, animals are fed diets containing definite weights of protein from a single food source —milk, eggs, meat, beans, cereal, etc. When the proteins from a single food source are added to a basal diet supplying the essentials other than protein, the amount of growth obtained from each gram of protein is a measure of the efficiency of the food as a source of protein. These biological studies have built up our knowledge of the comparative efficiency of the proteins present in different foods and in some cases of single proteins.

Some foods also contain simple nitrogenous compounds called "extractives," formed from the breaking down of the proteins. They are present in small amounts and are important chiefly as sources of flavor in foods.

Minerals. Minerals are usually closely associated with the organic portion of the food, though some are present in inorganic forms. The mineral constituents do not yield energy in the body, but are useful as body-building and regulating materials. The minerals known to be essential are calcium, magnesium, sodium, potassium, phosphorus, sulfur, chlorine, iron, copper, iodine, manganese, cobalt, and zinc. Aluminum, nickel, fluorine, silicon, and boron have been shown to be present in traces in body tissues and in foods. None of these latter minerals have been proved essential.

The proximate components in any food are determined by chemical analysis. The average results of analyses are brought together in tables of food composition.[1] These tables give the percentage of waste in the food as purchased and the composition of the edible portion in terms of protein, carbohydrates, fat, ash, or total minerals. Selected data from these tables will be used in appropriate chapters throughout this text.

DIGESTION AND ABSORPTION

Before energy and building materials are available for use in the body, food must be digested and absorbed.

Digestion of Food. There are certain definite forms in which food nutrients are absorbed and carried to the body tissues, and the whole digestive process functions to break down complex foods into these forms. This breaking down, or digestion, is accomplished by means of chemical substances called "enzymes." That part of the body set aside for digestion, the alimentary tract, is highly specialized in its different portions. Each portion has its special job, and certain glands, or groups of cells, secrete digestive juices containing the enzymes needed to do the specific work of that portion.

Enzymes are substances produced by living cells which bring about chemical changes in other compounds without being used up themselves. Chemists call such a substance a "catalytic agent."

Digestive enzymes are specific in action. Each enzyme acts on only one food nutrient or group of nutrients. For example, in the intestinal secretion three sugar-splitting enzymes are present: sucrase, which splits sucrose, or cane sugar; maltase, which splits maltose, or malt sugar; and lactase, which splits lactose, or milk sugar. On the other hand, an enzyme such as pepsin in the gastric juice will digest any protein, but will act only on proteins.

The first test of the usefulness of any material as food is whether the digestive tract is equipped with an enzyme to change it into a form that can be absorbed and used by body tissues. Studies of certain carbohydrates, such as cellulose, Irish moss, and agar agar, present in some foods, have shown that the human digestive tract has no enzymes to digest them. The same is true of mineral oils. These oils are high in energy value but are useless as food, since the digestive tract is not equipped with an enzyme to break them down into a form that can be used. Both these groups of substances pass through the intestinal tract unchanged. Since they increase the bulk and improve the consistency of the intestinal residue, they frequently are used in cases of constipation.

Ease of Digestion. Some foods are digested more quickly than others. Certain conditions in the food or in the digestive tract may retard digestion to such a degree as to cause discomfort. Right conditions facilitate the digestion of any food.

Palatability has an important part to play in initiating digestion. Appetizing odors and the sight or taste of desirable food may start the flow of the digestive juices before there has been any physical contact of the food with the digestive area. Even the thought of appetizing food is said to "make the mouth water." Well-prepared, palatable, tempting-looking food is an important factor in good digestion.

Certain constituents of food affect the

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[1] The available data on food composition are assembled in this bulletin: C. Chatfield and G. Adams, *Proximate Composition of American Food Materials*, United States Department of Agriculture, Circular No. 549, 1940.

flow of the digestive juices after entrance into the stomach. The extractives in clear meat soups stimulate chemically the flow of the digestive juices. For these reasons flavorful fruits and well-flavored soups are good starters for a meal. On the other hand, fats tend to retard the flow of digestive juices, so that they should never be used extensively in the first part of the meal.

The physical form in which the food is taken may affect the ease and completeness of digestion. Hard, compact cheese is more difficult to digest than the same cheese grated or with the particles separated by being mixed with some other foodstuff. Tough meat is more digestible when ground or when the connective tissue has been softened by cooking. The nutrients of certain vegetable foods are more accessible after the cellulose has been softened. Starches are rendered more easily digested by cooking. Most protein foods are easier to digest after cooking at temperatures below boiling than when cooked at higher temperatures. At high temperatures proteins harden and may form masses which digestive juices penetrate with difficulty.

In selecting a method of preparation for any food, the foregoing factors must be balanced. One method may improve the flavor of the food, its appearance, and its physical form, but overcook the protein. In general, the tendency in food preparation is to favor methods which increase palatability, if not at too great sacrifice of other factors.

Absorption of Food. After the foods have been digested, they must be absorbed. The calculated percentage of absorption of the different food nutrients is arrived at by a comparison of the composition of the food consumed with the food residue. Since the feces contain not only undigested and unabsorbed food but also residues from the digestive juices, intestinal debris, and bacteria, the results are approximate.

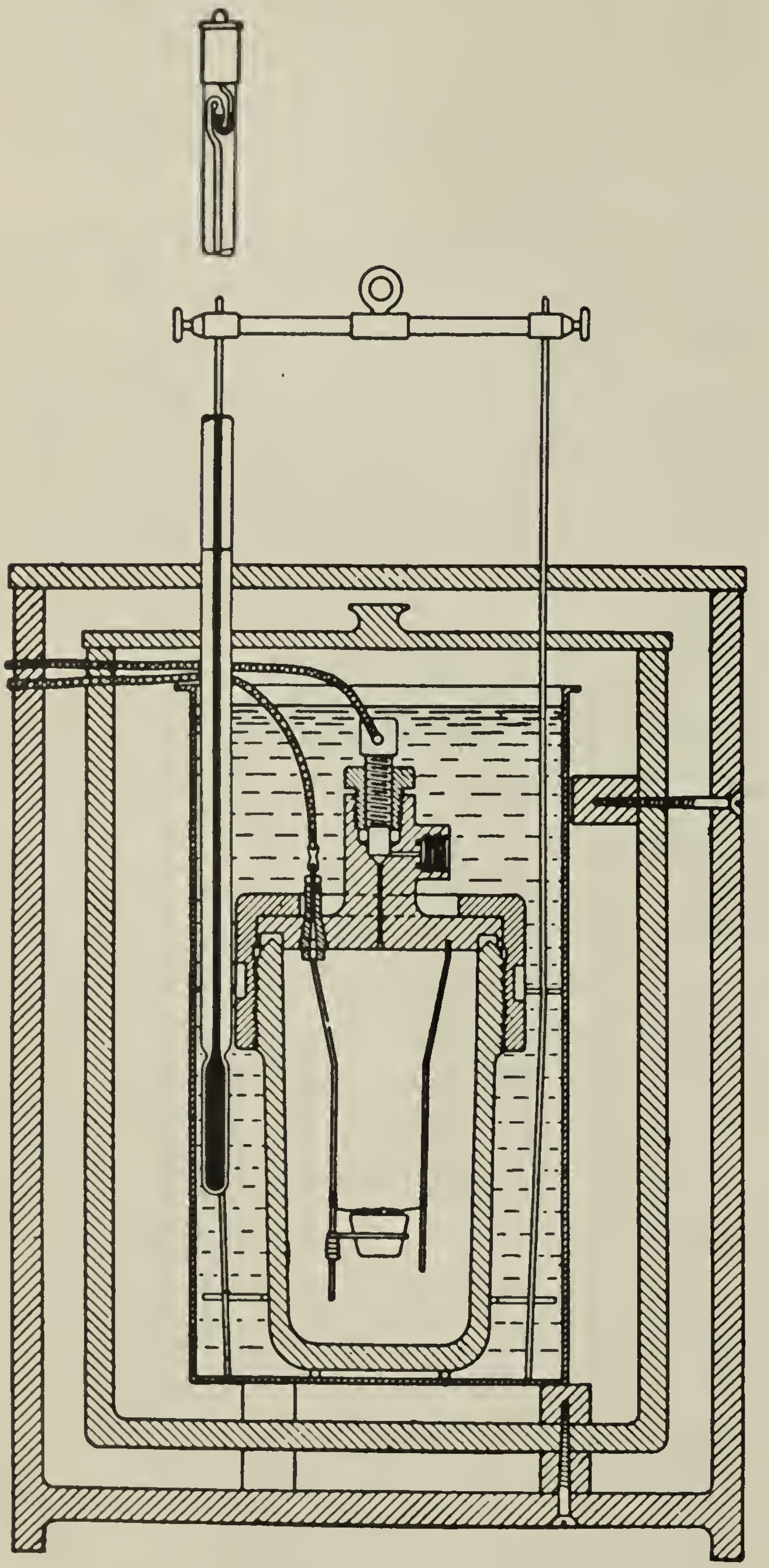
General percentages for probable absorption of the three basic components of foods have been established as follows: protein, 92 per cent; fat, 95 per cent; and carbohydrates, 98 per cent. These percentages will vary, depending upon the food source of the nutrient and the amount of undigestible material it contains.

In the past, too much attention has been paid to the completeness of absorption of a food. Many persons suffer from constipation as a result of the use of too large a proportion of highly refined foods which are too completely absorbed. Certain groups of foods are now recommended for the residue they leave, and the influence of this residue on elimination.

The degree of absorption of the nutrients in any food is largely controlled by two factors: the completeness of the digestion of all the components of the food and the rapidity of its passage through the intestinal tract. Those foodstuffs are most completely absorbed which contain the smallest amount of indigestible material. Animal foods, on this account, are very completely absorbed. On the other hand, water-retaining residues such as result from cellulose-containing vegetables and fruits are desirable to promote normal elimination. An important value in a mixed diet lies in the possibility of combining foods which leave the amount of residue best adapted to the individual need. Any condition which hastens the passage of the food residue through the small intestine decreases absorption.

THE ENERGY IN FOOD

As food is digested and absorbed, portions needed to form the body's own tissues and fluids are used; other portions are burned as an immediate source of energy; and any excess is stored in the form of fat, sugar, or glycogen for use as needed. The food becomes a part of the living organism from which later it may be thrown off as waste or inert material.



Atwater Bomb Calorimeter[1] · A weighed amount of the food to be tested is burned in the small central capsule. The heat given off is absorbed by the water surrounding the bomb. The volume of water being known, the calories given off can be calculated from the increase in its temperature

Organic Foods. Before the knowledge of chemistry had developed to its present level, materials were divided into organic and inorganic on the basis of whether or not they were products of living organisms. Organic substances then were available only as the result of plant or animal life. Now many organic substances can be synthesized in the laboratory, so that the old definition has lost its significance. But all organic materials contain carbon in a form that will burn. Under suitable conditions this carbon unites with oxygen, or is oxidized, and in the process releases energy. In nature the reduction of carbon, changing from an oxidized form (carbon dioxide) to the unoxidized forms present in organic compounds, is accomplished by the activity of a plant cell.

Plants build energy into foods. Plants are able to take inorganic compounds like carbon dioxide (oxidized carbon) from the air, and water and soluble minerals from the soil, and combine these to form organic foods. The energy required to make this change comes from the sun. Green plants use energy from the sun to manufacture organic material from the simple inorganic compounds that they have absorbed. This process is known as "photosynthesis." In the plant, carbon dioxide and water are combined to form sugar. Oxygen is given off. The chemical change is shown by the following equation:

$$\underset{\text{Carbon dioxide}}{6\,CO_2} \; \underset{}{+} \; \underset{\text{water}}{6\,H_2O} \; \underset{}{=} \; \underset{\text{simple sugar}}{C_6H_{12}O_6} \; \underset{}{+} \; \underset{\text{oxygen}}{6\,O_2}$$

Plants store food to carry them through periods of inactivity, as starch in the potato or sugar in the beet. Starch, fats, and proteins are stored in the seed for the development of a new plant. The energy value of any individual plant or part of a plant depends largely upon the amount of such stored material present. The body substance and stored materials of plants are used as food. When this material is burned in the body, the energy originally built in it is made available. This energy is used to keep the body warm, to perform muscular work, or to furnish energy for building organic compounds essential in the body structure. Any excess energy may be stored as fat.

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[1] From H. C. Sherman: *Chemistry of Food and Nutrition.* 4th Ed. Copyright, 1932 by the Macmillan Company and used with their permission.

Plants are transformers of energy. Food may be looked upon as a form of energy available for human use. In nature much energy goes to waste because it is not in a form in which it can be used. The question of the human food supply becomes essentially a question of harnessing or catching energy from the sun, which otherwise would not be used, and transforming it into an available form. A large amount of energy is radiated from the sun. This cannot be used directly as a source of body energy. Just as the energy of the falling water must be transformed before it becomes available for use, so the plant must absorb energy from the sun and use it in building organic foods before the energy becomes available for human or animal use.

Plant foods are the original source of all food energy. For this reason they are sometimes called primary foods. Animals are valuable, however, in unlocking stores of plant foods otherwise not available as human food and changing them into palatable and easily transported forms. Animal fats are important sources of energy in the diet. Animals also build from plant foods protein compounds that may be used economically (physiologically speaking) as sources of body-building materials.

The energy in fuels–wood, coal, and oil–is all originally of plant origin, and the energy in them came from the sun entrapped through the life activity of the plant. Although the chemist may now build, or synthesize, organic compounds in the laboratory, the organic or energy-containing materials are as yet largely the result of life.

Calories. To measure the energy value of foods, a heat unit called the "calorie" is used. A large calorie, or kilogram-calorie, is the amount of heat required to raise one kilogram of water one degree centigrade.

The determination of the calorie content of foods is based upon the assumption that these compounds yield the same amount of energy when burned in the body as when burned outside. Carbohydrates and fats burn completely in the body, yielding carbon dioxide and water. Protein, on the other hand, is not completely burned in the body, but always leaves a nitrogenous residue which represents a certain amount of energy. In determining the fuel value of protein foods, it is necessary to correct for this loss. This is done by subtracting from the total amount of energy yielded by burning protein outside the body the amount of energy represented by the urea and other nitrogenous materials remaining when that same amount of protein is metabolized in the body.

A calorimeter is used to measure the calories given off when a weighed quantity of food is burned under controlled conditions. By the use of this instrument the calorie content of the food nutrients has been established. After the necessary corrections, it is estimated that, when burned in the body, each gram of carbohydrate yields four calories; each gram of protein, four calories; and each gram of fat, nine calories. By use of these values, it is possible to compute the calorie content of any food the composition of which is known. The fuel value per pound of the common foods given in tables of food composition is usually computed rather than determined directly.

BUILDING AND REGULATING FOODS

The regulating function of food is carried out largely by maintenance of the normal composition of important tissues and fluids.

The same food components serve both building and regulating functions. Active body tissues are composed of approximately two-thirds water and one-third protein. The body as a whole contains three to four per cent ash or mineral substances. Fats and carbohydrates are found in the body in varying amounts depending upon the plane of nutrition. Small amounts of these are essential.

Water. Water is an important component of the body. Life can be maintained many days without other food if water is supplied. But if water is not taken in some form, the amount of it in the body tissues and fluids is lowered markedly below the normal amount, and death soon results. Water serves several important functions: (1) it aids in digestion and absorption of foodstuffs; (2) it serves as a vehicle for the transportation of absorbed food to the various parts of the body; (3) it aids in elimination of waste from the intestinal tract; (4) it is a means of elimination of soluble waste products through the urine; and (5) it regulates body temperature through evaporation from the surface of the body. Normal consumption of water is desirable for the functions named above, and any wide variation from this is to be avoided.

Normally thirst will guide the intake of water, but it is wise to form habits of drinking water which will assure a sufficient quantity. It usually is recommended that 6–8 cups of liquid be consumed each day in addition to that contained in the solid foodstuffs. More is required in hot weather when perspiration is abundant. Water taken at mealtimes, if not too cold, and not used as a means of washing down food, is beneficial to digestion and absorption of food. Water drinking should not be limited to mealtime, however, and the habit of drinking water at regular intervals between meals should be formed.

Protein. After water, protein is the nutritive constituent present in the largest amounts in body tissues and the one whose importance has been most stressed. Protein in some form is an essential part of all body tissues and fluids. It is not so abundantly available as water, nor is there an indicator comparable to thirst to show when the supply of body protein is low.

Proteins from different sources vary in usefulness in supplying body needs. Animal proteins are in general more efficient than those of vegetable origin, since they yield the amino acids in more nearly correct proportions for building body tissues. Individuals require more protein per unit of body weight during periods of growth than after growth has been completed. More is required after wasting illnesses, surgical operations, burns, and other injuries. The body has no means of storing an excess of protein, but tends to excrete the nitrogenous portion and to use the remainder for energy. The amount needed should be supplied in the food each day.

Minerals. The mineral constituents of the body are present in largest amounts in the bones or the structural portions of the body. They are present also in varying proportions in all body cells and fluids, contributing to them their characteristic reactions.

While too few data are available as yet to make possible exact calculation of the requirements for all the essential mineral elements, recommended allowances have been established for calcium, phosphorus, and iron (see Table LXVII). Potassium, sulfur, sodium chlorine, and magnesium are so abundantly available in foods that any accurate check of the amount supplied by the diet is unnecessary. Iodine is present in required amounts in natural foods in some areas. Where the soil is deficient in this mineral, as it is in many sections of the country, the use of iodized salt is recommended (see page 350).

The rarer minerals, some of which have been shown to be essential in small amounts, are normally present in all except the most highly purified foods. Because these occur generally in natural foods, their significance was not recognized until comparatively recently. So long as diets are made up largely of natural foods, any diets which provide adequate amounts of energy and protein will probably contain sufficient minerals, with the possible exception of calcium and iron. Lists of good food sources of calcium are given in Table I.

Vitamins. The vitamins as a group are not closely related as to source or composition. As each was identified as essential it was designated a "vitamin" or "required for life." They were distinguished from each other by letter designations and later given names indicating the deficiency each prevented. As knowledge of the chemical properties and composition of these nutrients has been developed, some have been given names descriptive of their composition.

Vitamins may be placed in two subgroups on the basis of solubility, which is a clue to their food sources.

Table I · *Approximate Average Calcium Content of the Edible Portion of Some Typical Foods*[1]

Food	Calcium (milligrams[1] per pound)
Apples (4 average-sized)	24
Bananas (4 good-sized)	24
Beef, lean	45
Bread, white	200
Bread, whole-wheat	250
Broccoli (4 cups, cooked)	400
Butter	70
Cabbage, headed	150
Carrots	150
Cheese, Cheddar type	3,960
Eggs (8 or 9)	218
Kale	650
Milk (scant pint)	535
Potatoes (4 good-sized)	50
Sweet potatoes (4 good-sized)	100
Tomatoes	50

[1] Reprinted from H. C. Sherman, *Principles of Nutrition and Nutritive Value of Food*, Miscellaneous Publication No. 546, United States Department of Agriculture, p. 17.

Important Vitamins

FAT-SOLUBLE

A including the carotins (provitamin A)
D (antirachitic factor)
E (antisterility factor)
K (antihemorrhagic factor)

WATER-SOLUBLE

B a group of factors, the best known of which are
  B_1 Thiamine (antineuritic)
  B_2 Riboflavin
  Niacin (antipellagra)
C Ascorbic acid (antiscorbutic)

Vitamin A stimulates growth and is necessary for well-being at all ages. It is essential to the normal development and functioning of the mucous membranes of the body. An adequate amount of vitamin A is an important factor in keeping the linings of the respiratory, digestive, and excretory systems in a healthy condition.

An early sign of vitamin A deficiency is an inflammation of the membranes of the eye, resulting in the condition known as "xerophthalmia." If this condition is allowed to continue, it leads to blindness. This vitamin is important also in control of the adjustments made by the eyes to changes in light. Persons whose eyes adjust slowly in going from light to dark are frequently found to be on diets with inadequate amounts of vitamin A.

Vitamin A is measured in terms of international units determined by both biological and chemical methods. The fish oils are the most potent sources of this vitamin. In plant foods it occurs as one of the carotins. In the body carotins are converted to vitamin A. For this reason foods having a yellow or green color are generally rich sources of vitamin A. Green leaves, yellow corn, and sweet potatoes are better sources of vitamin A than bleached leaves, white corn, and white

Table II · *Approximate Vitamin-A Values of the Edible Portion of Some Typical Foods*[1]

FOOD	INTERNATIONAL UNITS	
	Per 100 grams	*Per pound*
Fish-liver oils[2]	200,000–300,000	About 1,000,000
Deep-green leaves such as those of broccoli, chard, dandelion, escarole, kale, mustard, spinach, turnip tops	10.000– 20,000	45,000–90,000
Broccoli, entire edible part	3,000– 9,000	13,000–40,000
Carrots, sweet potatoes, apricots (dried)	2,000– 10,000	9,000–45,000
Butter	2,000– 4,000	9,000–18,000
Eggs, cheese[3]	1,000– 2,000	4,500– 9,000
Tomatoes, cantaloupe	900– 1,300	4,000– 6,000
Milk	200	900
Potatoes[4]	30– 40	140– 180

potatoes. Thin green leaves are an especially rich source. Vitamin A is only slightly soluble in water, and is more stable under heat than some of the other vitamins. Table II lists the more important food sources of vitamin A, and the A values of definite amounts of the edible portions of these.

The **vitamin B** family has increased in size during the last few years. They are a clannish group and commonly occur together in a wide variety of natural foods. Some foods are especially important as a source of one or another member of this important group of nutrients. For the group as a whole, the glandular organs, the seeds, and the growing portions of plants are the important sources. These vitamins are all measured in micrograms or milligrams.

It is a co-operative family the work of one member frequently supplements that of another. Three members of this group, thiamine, riboflavin, and niacin, have been studied in sufficient detail to establish definitely the amounts desirable each day. These will be discussed in detail below. There are at least seven other members[5] of this group, and information is fast developing as to their functions and the amounts in different foods. For the present it is safe to assume that a food supply which contains satisfactory amounts of thiamine and riboflavin from natural sources will not be lacking in the other factors of the B complex. For this reason, retention of vitamins in processing foods seems a wiser procedure than enrichment with only those B factors now readily available in synthetic form.

Thiamine, or vitamin B_1, is necessary for good appetite and is essential to the use of the energy in our food. When this vitamin is present in inadequate amounts, the carbohydrates in the body fluids are incompletely oxidized and form by-products that decrease the appetite and cause general listlessness, sluggish digestive systems, and nervous irritability. The absence of this vitamin in the diet brings on muscular paralysis and the deficiency disease known as beri-beri.

Thiamine is especially important in the diets of nursing mothers and infants. Without enough of it, the mother's milk may be poor in both quantity and quality. Adequate amounts of this vitamin in the mother's diet provide the amounts needed for nursing infants.

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[1] H. C. Sherman, *Principles of Nutrition and Nutritive Value of Foods*, Miscellaneous Publication No. 546, United States Department of Agriculture, p. 20.

[2] Figures here given represent a presumably safe average for fish oils generally, including the long-used cod-liver oil. There are, of course, particular species of fish, such as halibut and percomorph, the liver oils of which have much higher vitamin-A values.

[3] Including common American cheese (Cheddar type) and other kinds made from whole milk.

[4] Breeding experiments for the production of potatoes of distinctly higher vitamin-A value have been reported.

[5] These are pantothenic acid, pyredoxine, para-amino benzoic acid, folic acid, bioten, choline, and inositol.

The list of foods containing thiamine is long, since a large number of foods contain small quantities of this vitamin. Pork is the richest natural source of thiamine; most fruits and vegetables contain some, and all seeds are rich sources of this vitamin. In cereals thiamine is most abundant in the germ and other portions removed in milling.

Thiamine is destroyed by heat more readily than vitamin A, especially in solutions with an alkaline reaction. Long cooking and cooking at high temperatures tend to destroy thiamine. Since this vitamin is very soluble in water, it may be washed out in cooking when much water is used.

Riboflavin, the second member of the vitamin-B group, is similar in function to thiamine. It plays an important part in the formation and functioning of oxidative enzymes in body tissue that are responsible for release of energy. It is essential for well-being at all ages. A continued deficiency of riboflavin causes loss of weight and premature appearance of old age.

Riboflavin occurs in many foods in moderate or small quantities. The best sources are glandular organs, lean meat, eggs, milk (either whole or skimmed, fresh, canned, or dried), green leaves, the germ portion of cereals, and yeast. Like thiamine, riboflavin is very soluble in water. It withstands heat of cooking much better than thiamine.

Table III lists the important food sources of thiamine and riboflavin and the approximate amounts contained in 100-gram edible portions of these foods.

Niacin, or nicotinic acid, the third important member of the B group, is sometimes designated as the "antipellagra" vitamin. Niacin is an important factor in the cure of pellagra, but complete recovery requires other important nutrients. Pellagra, a deficiency disease, is apparently a multiple deficiency in which the absence of niacin plays an important part.

Early work by the United States Public Health Service and the United States Department of Agriculture indicated that pellagra is prevented by including in the diet each day a quart of milk or buttermilk, or a pint of evaporated milk, six to eight ounces of dry skim milk, lean meat, canned salmon, peanut meal, or one pound of fresh or canned collards, kale, green peas, or turnip greens. The usefulness of these foods in the prevention of pellagra is probably due in part to the presence of other factors along with the niacin.

It can be assumed that when the diet supplies adequate amounts of thiamine and riboflavin from natural food sources, the need for niacin as an antipellagra factor has been met.

Vitamin C, or ascorbic acid, is essential at all ages. The body lacks ability to store this vitamin for any period of time; so the needed amounts should be provided each day. The function of vitamin C is to keep the "cement substance," which lies between the body cells, in a healthy functioning condition. Lack of it causes leakage of the blood through the tissues and results in bleeding gums, loose teeth, sore joints, and a lack of muscle tone which shows itself as fatigue. In the absence of vitamin C in the diet the deficiency disease, scurvy, develops. Though scurvy is rare in this country, the borderline conditions indicated above are seen frequently, and can be corrected by increasing the C content of the diet.

Table IV shows the average vitamin-C content of typical *raw* foods. This vitamin is very unstable and is easily oxidized. This oxidation is hastened by heat, the presence of air, contact with metals such as copper and iron, which increase the rate of oxidation, TABLE III · *Approximate Average Thiamine and Riboflavin Content in 100 Grams Edible Portion of Some Typical Foods*[1]

Food	Approximate Measure	Thiamine	Riboflavin
		Micrograms	*Micrograms*
Beans, dried	½ cup, after baking	500	300
Beans, snap	¾ cup 1-inch pieces	75	110
Beef muscle	3.5 ounces	150	220
Bread, white, *enriched*[2]	4 to 5 slices	240[2]	154[2]
Bread, white, not enriched	4 to 5 slices	About 60[3]	104[3]
Bread, whole-wheat	4 to 5 slices	300[4]	130[4]
Broccoli	1 cup, cooked	100	300
Cabbage, headed	1½ cups, chopped, raw	100	60
Cantaloupe	¼ melon 5 inches in diameter	60	70
Carrots	¾ cup ½-inch cubes	100	70
Eggs	1.8 eggs	150	350
Kale	1 cup, cooked	150	500
Liver[5]	3.5 ounces	350	2,800
Milk	0.45 cup	40	200
Orange, or juice	1 small orange or ⅜ cup juice	100	50
Peas, fresh green,	¾ cup, shelled	400	200
Pork muscle	3.5 ounces	1,000	240
Potato	1 small; ¾ cup, riced	175	42
Sweet potato	1 small	100	80
Tomato or juice	1 average-sized or ⅜ cup juice	90	45

and by an alkaline reaction. Fruits and vegetables are the important sources of vitamin C. It is a good plan to use some raw fruit or vegetable each day. The chapters on fruits and vegetables will discuss methods of preparation to conserve this vitamin.

Vitamin D is called the antirachitic factor because of its influence on the proper use of calcium and phosphorus in building bone and teeth. Lack of this vitamin contributes to the condition known as rickets in children and other abnormal bone conditions in adults.

Some fish-liver oils are rich sources of vitamin D. It may be present in small amounts in milk and eggs. Vitamin D is developed in the body by exposure of the skin to the direct rays of the sun; so it is sometimes called the sunshine vitamin. It is formed in certain foods by irradiation or exposure to ultraviolet light. Both children and adults should have additional amounts of vitamin D during the winter months, when exposure to the direct rays of the sun is limited.

TABLE OF FOOD NUTRIENTS

For the use of dietitians, nutritionists, and others who plan diets or calculate the adequacy of the food of a family or group, tables of food composition have been assembled[6] in terms of water and energy content and 11 nutrients: water, food energy as calories, protein, fat, carbohydrates, calcium, phosphorus, iron, vitamin A, thiamine, ribo-

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[1] H. C. Sherman, *Principles of Nutrition and Nutritive Value of Food*, Miscellaneous Publication No. 546, United States Department of Agriculture, p. 23.

[2] According to the official definition and minimum standards effective from October 1, 1943.

[3] Varies with kind of yeast and amount of milk used in bread-making.

[4] Whole-wheat flour should ensure the amounts stated, while use of milk and special yeast in bread-making may result in much higher values.

[5] Average of kinds commonly used as human food.

[6] By the Bureau of Human Nutrition and Home Economics of the United States Department of Agriculture, in co-operation with the National Research Council, Miscellaneous Publication No. 572, United States Department of Agriculture.

Table IV · *Vitamin C in Edible Portion of Some Typical Raw Foods*[1]

Food	Measure of 100-gram Portion	Milligrams per 100 Grams
Turnip greens	3½ oz., raw; ½ cup, cooked	150
Broccoli	1 cup, cooked	115
Cauliflower	⅓ small head	76
Cabbage	1½ cups, chopped, raw	58
Orange or juice	1 orange or ½ cup juice	54
Strawberries	⅔ cup	53
Grapefruit or juice	½ cup	39
Turnips	¾ cup ½-inch cubes	31
Cantaloupe	¼ melon 5 inches in diameter	29
Peas, fresh green	¾ cup, shelled	24
Tomato or juice	1 average-sized or ½ cup juice	23
Sweet potato	1 small	19
Snap beans	¾ cup 1-inch pieces	19
Potato	1 small, 2½ inches in diameter	19
Onions	½ cup, sliced	18
Lettuce	6 large leaves (½ head)	11
Peach	1 medium-sized	8
Carrots	¾ cup 1-inch cubes	6
Apple	1 average-sized	5
Grapes	½ cup (20 large-sized)	4
Milk	½ cup, scant	2

flavin, niacin, and ascorbic acid. The values given in this table are the average values arrived at by study of the data from many sources. A portion of this table has been reprinted in the appendix, Table LXVI, p. 367. In this table the foods are grouped into ten rather broad classifications on the basis of similarity of function within the body. Within limits, food requirements may be stated in terms of these broad groups.

AMOUNTS OF NUTRIENTS REQUIRED

Studies of nutrition not only have determined the nutrients required and their functions but also have made progress in establishing the amounts desirable under different conditions.

It is as yet difficult to state these requirements with definiteness. Some studies show the minimum amounts, the amounts below which deficiency conditions are likely to develop; other studies indicate that moderate increases above these minimum levels make for increased health and efficiency.

As a basis for arriving at definite amounts against which the adequacy of diets could be measured, a Committee of the Food and Nutrition Board of the National Research Council has reviewed and summarized the existing data on the amounts of nutrients considered desirable in a bulletin entitled *Recommended Dietary Allowances*.[2] On the basis of the assembled data, agreement was reached as to the amounts of ten nutrients recommended for persons differing in sex, age, activity, and condition. The table stating these is reprinted in the appendix, p. 379, as Table LXVII.

This table is useful to dietitians and any persons responsible for planning food supplies for groups of any size. Adjusting the food supplies to provide the nutrients required by those to be fed is an important factor in good food management. Data from the table in the bulletin *Recommended Dietary Allowances* now are used to check the adequacy of national food supplies. The United States Department of Agriculture has published an analysis of the per capita food supply for this country from 1909 to 1945.[1]

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[1] H. C. Sherman, *Principles of Nutrition and Nutritive Value of Food*, Miscellaneous Publication No. 546, United States Department of Agriculture, p. 25.

[2] *Recommended Dietary Allowances*, Reprint and Circular Series, No. 122, National Research Council, Washington, D. C. (September, 1948).

The International Food and Agricultural Organization has made an estimation of the world's food supply and its adequacy.[2] Thus the facts of nutrition are being used to guide agricultural production to provide the foods needed for the nutritional improvement of the human race.

Agricultural production is stated in terms of food and commodity groups. These same food groups are used to guide individuals in daily selection and homemakers in preparing daily and weekly market lists.

A Picture of Abundant Health · Building good food habits is an important step in attaining abundant health

U.S.D.A.

BASIC SEVEN FOOD GROUPS

All foods are good, but diets require a variety of foods if they are to supply all the materials the body needs. As the nutrients in foods have been discussed, important food sources of these have been listed. Some foods supply several nutrients; others may supply only one or two. The special contributions of individual foods and groups of foods will be discussed in detail in later chapters.

Studies of foods as sources of the required nutrients have shown that the foods may be divided into seven groups. The foods within each group are similar in their nutrient content. These groupings were given wide publicity in a nutrition chart prepared by the Interdepartmental Nutrition Committee[3] for wartime use. This chart is shown on page 19. It is equally useful to guide food selection in time of peace.

Use has been made of the basic seven groups in a *National Food Guide* published by the Bureau of Human Nutrition and Home Economics.[4] The guide gives a list against which an individual may check the adequacy of his daily food supply. If the amounts recommended from each group are used, these foods will supply all the nutrients needed for body building and regulating and a good share of the energy needed. These simple rules are reprinted here. The need for calories varies widely. It is important that the diet supply sufficient calories but not too many; so a special list of energy foods has been added to the basic seven to guide this adjustment. These are the foods to add when more calories are needed, to leave out when the calorie content of the diet is too high.

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[1] Faith Clark and Jeanette B. McKay, "Nutritive Value of the U. S. Food Supply," *Journal of Home Economics*, Vol. 38, p. 333.

[2] *World Food Appraisal for, 1946–1947 and the State of Food and Agriculture 1948*, Food and Agricultural Organization of the United Nations, Washington, D.C., December, 1946, and September, 1949.

[3] A committee established to co-ordinate the nutrition programs of the different government agencies.

[4] Bureau of Human Nutrition and Home Economics, United States Department of Agriculture, AIS–53.

The foods within each group are much alike in food value and may be used interchangeably. This gives opportunity for variety by choices within groups. Just be sure that the specified servings from each group are used each day.

Daily Food Guide

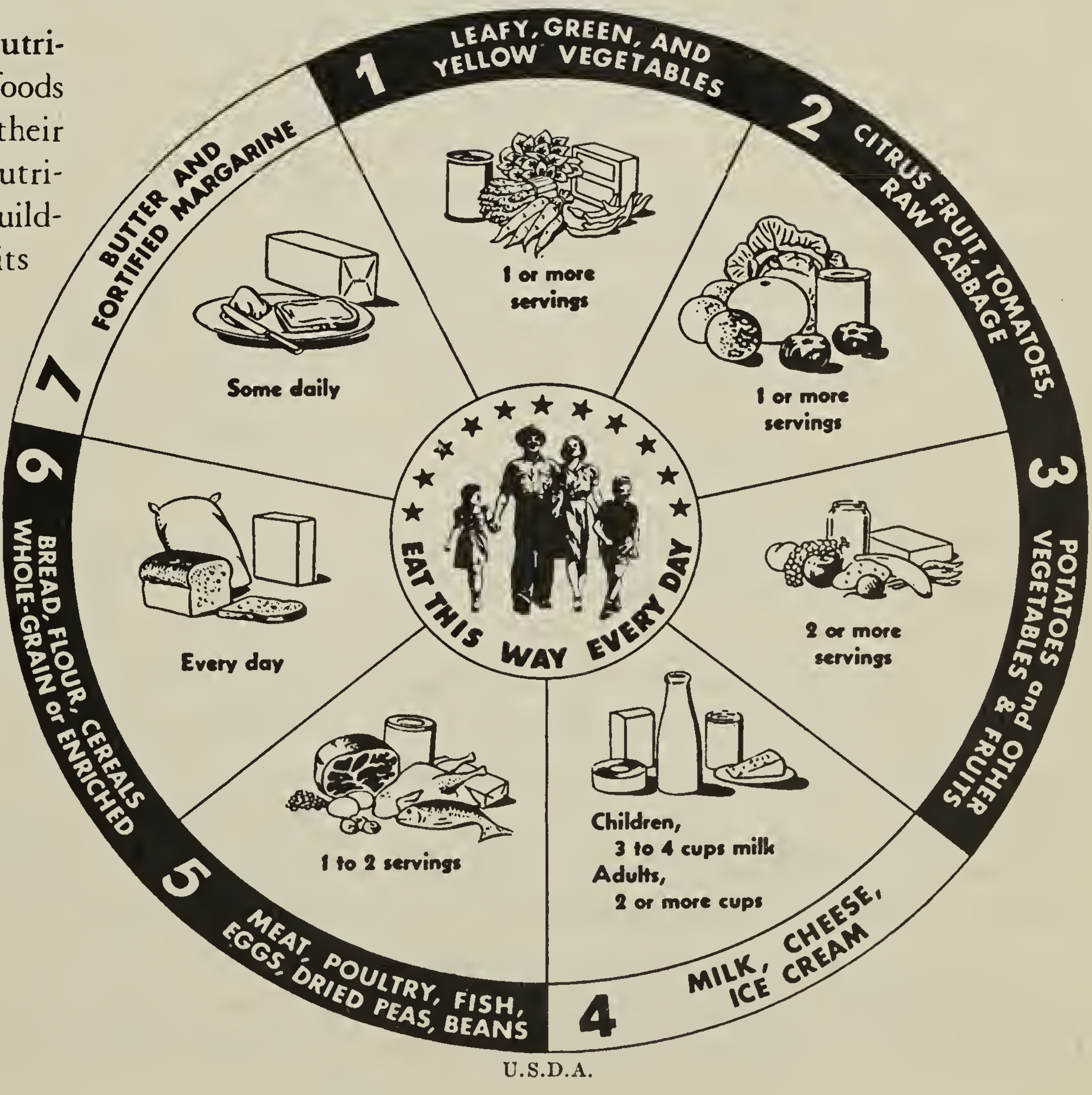
Check your meals against these rules:

1. *Leafy, green, and yellow vegetables:* One or more servings daily.
2. *Citrus fruit, tomatoes, raw cabbage, and other high vitamin-C foods:* One or more servings daily.
3. *Potatoes and other vegetables and fruit:* Two or more servings daily.
4. *Milk, cheese, ice cream:* Children through teen age, 3 to 4 cups milk daily; adults, 2 or more cups milk daily; pregnant women, at least 1 quart milk daily; nursing mothers, about $1\frac{1}{2}$ quarts milk daily.
5. *Meat, poultry, fish:* One serving daily, it possible. *Eggs:* Four or more a week. *Dried beans and peas, nuts, peanut butter:* Two or more servings a week.
6. *Bread, flour, and cereals* (whole-grain or enriched or restored): Every day.
7. *Butter and fortified margarine:* Some daily.

The basic seven foods give energy and protect health. The foods listed below give chiefly **energy.** They may be eaten in addition to the basic seven foods, but not in place of them.

Bacon
Drippings
Lard, other shortenings
Mutton fat
Poultry fat
Salad dressings
Salad oils
Salt pork, fat back
Suet

A Guide to Good Nutrition · This grouping of foods in accordance with their major contribution to nutrition is a guide in the building of good food habits


1 LEAFY, GREEN, AND YELLOW VEGETABLES
1 or more servings
2 CITRUS FRUIT, TOMATOES, RAW CABBAGE
1 or more servings
3 POTATOES AND OTHER VEGETABLES & FRUITS
2 or more servings
4 MILK, CHEESE, ICE CREAM
Children, 3 to 4 cups milk
Adults, 2 or more cups
5 MEAT, POULTRY, FISH, EGGS, DRIED PEAS, BEANS
1 to 2 servings
6 BREAD, FLOUR, CEREALS WHOLE-GRAIN or ENRICHED
Every day
7 BUTTER AND FORTIFIED MARGARINE
Some daily
EAT THIS WAY EVERY DAY

U.S.D.A.

Honey
Jams
Jellies
Molasses
Preserves
Sirup
Sorghum

Cornmeal, degerminated
Cornstarch
Hominy grits
Macaroni
Noodles
Rice, white
Spaghetti

Cakes
Candy
Chocolate
Cocoa
Cookies
Pastries
Sugar
Other sweets

Unenriched:
  Crackers
  White bread, rolls
  White flour

It is a good idea to list all the food eaten each day. Include food taken between meals as well as at meals. Check this list against the basic seven; and if any group is lacking, make plans to include it in the choices for the next day. By a little thought and checking against the basic seven, food habits are built that provide all the essentials of a good diet.

When the opportunity affords, weigh the food eaten for a day; by using Table LXVI, the nutrients in each food can be calculated and the total in the food for the day determined. If this is compared with amounts required, it will give a more accurate check of the diet than the basic seven.

FAMILY FOOD SUPPLIES

Family needs vary with the number in the family and individual requirements. The total needs are the sum of individual needs. To help homemakers provide adequate diets the following plans have been developed by the Bureau of Human Nutrition and Home Economics.

Weekly Food Plans. Table V[1] (p. 23) shows the amounts of food, listed by food groups, that will supply an adequate diet for a week for persons who differ in age, sex, and activity. To simplify making the market list, the energy foods are in two separate groups, (1) fats and oils, and (2) sweets. The potatoes are listed separately from the other vegetables, the eggs and the dried legumes and nuts separately from meats and fish. These add up to eleven market groups in this table instead of the basic seven.

Table VI (pp. 24–25) indicates the size serving of these foods recommended and the number of times a week each food should be served.

Since the problem is most difficult with low-income families, the quantities are given for food plans at low and moderate cost. It is much easier to plan adequate diets when liberal food allowances are available.

In Table VII (pp. 26–27) food plans for two families have been worked out based on the amounts suggested. One is for a family of two and the other for a family of four with two young children. The items in each market list can be varied in many ways; the balance between the groups can be changed with the amount of food money. The suggested distribution at the two levels of expenditure is the one that gives the best returns in food values.

Menus based on these market lists will be found in the Appendix, pp. 381–382.

COMBINING FOODS INTO MEALS

Meals may well be simple, but the human animal demands that they be palatable. In the following chapters the different food groups are discussed to the end that one may not only select intelligently according to the dictates of nutrition, but also prepare palatable dishes suitable for different meals. To the principles of preparation set forth must be added practice, judgment, and standards, since good food preparation is an art. It is

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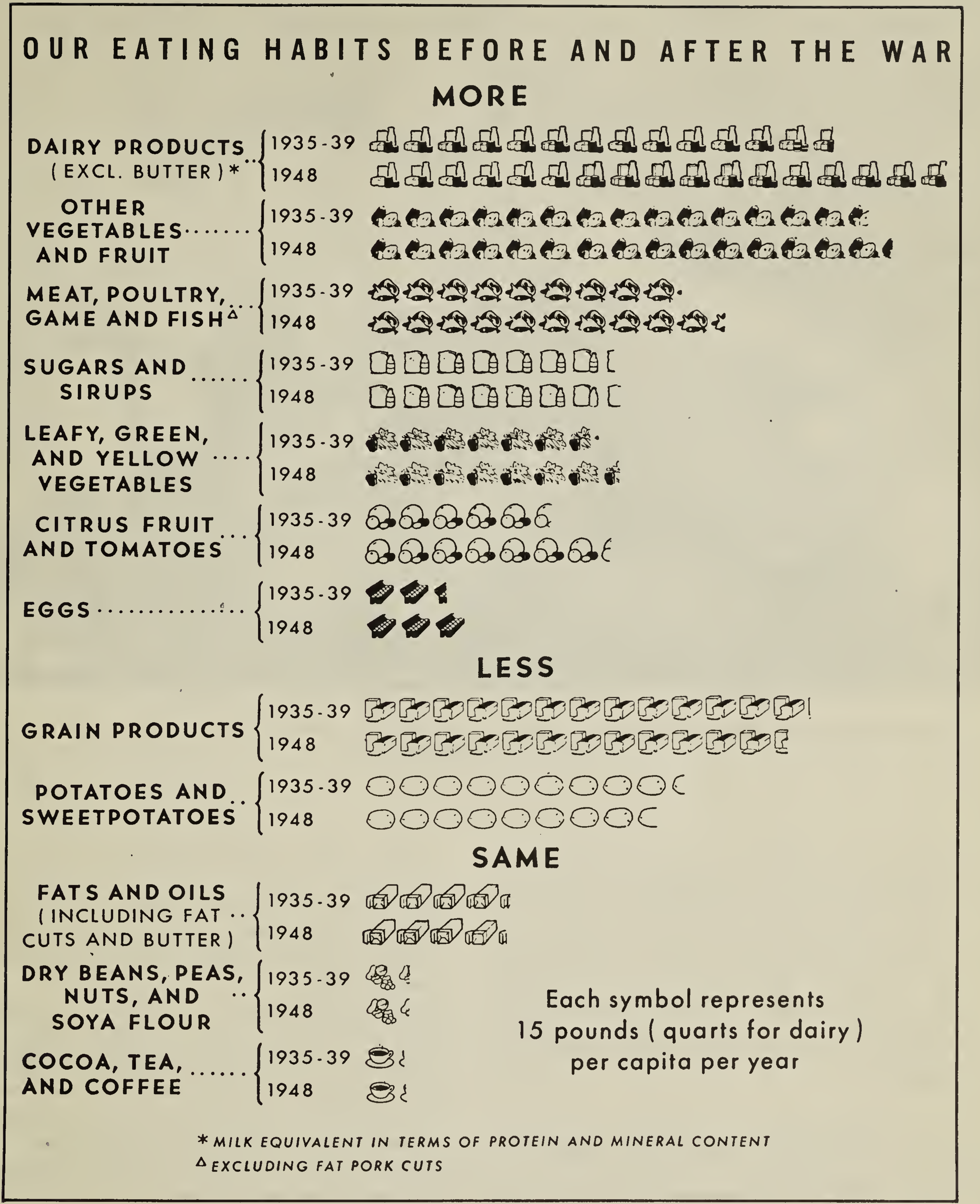
[1] Suggested market list prepared by the Bureau of Human Nutrition and Home Economics, United States Department of Agriculture. September, 1947.



U.S.D.A.

Nutrients in United States Food Supply · The nutritive quality of the civilian per capita food supply was considerably better during the Second World War than in the years 1935–1939, and this improvement has continued in the postwar period. The significant increases in the daily supplies of minerals and vitamins are due to the enrichment of cereal products and to the greater consumption of meat, fluid milk, citrus fruit, and leafy green and yellow vegetables

U.S.D.A.

A Good Selection · Menus that include foods like these will supply the family with the protein, minerals, and vitamins needed

hoped that pointing out some of the scientific implications in the selection and preparation of food may raise the level of the art, and that a beginning, at least, may be made in the development of a science of food preparation. Chapter XXVII gives suggestions for meal planning, preparation, and service.

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TABLE V · *Weekly Quantities of Food for Each Member of Family*

FAMILY FOOD PLAN AT LOW COST

Family members	Leafy, green, yellow vegetables		Citrus fruit, tomatoes		White potatoes, sweet potatoes		Other vegetables and fruit		Milk[1]	Meat, poultry, fish		Eggs	Dry beans and peas, nuts		Flour, cereals[2]		Fats and oils[3]		Sugar, sirups, preserves	
Children (under 12)	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.	Qt.	Lb.	Oz.	No.	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.
9–12 months[4] . .	1	8	2	0	0	8	0	8	7	0	2	5			0	8	0	1	0	1
1–3 years[5][6]. . .	1	12	1	12	1	0	1	0	5½	0	10	5	0	1	1	4	0	2	0	2
4–6 years. . . .	1	12	1	12	1	8	1	4	5½	1	0	5	0	2	1	12	0	6	0	6
7–9 years. . . .	2	0	2	0	2	8	1	8	5½	1	8	5	0	4	2	4	0	8	0	10
10–12 years. . .	2	4	2	4	3	0	1	12	6	1	12	5	0	4	3	0	0	12	0	12
Girls																				
13–15 years[6] . .	2	8	2	4	3	0	2	0	6½	2	0	5	0	4	3	4	0	12	0	12
16–20 years[6] . .	2	8	2	4	3	0	2	0	5	2	0	5	0	4	3	0	0	12	0	10
Boys																				
13–15 years. . .	2	8	2	8	4	0	2	4	6½	2	0	5	0	8	4	8	1	0	0	14
16–20 years. . .	2	12	2	8	5	0	2	8	6½	2	0	5	0	8	5	12	1	6	1	0
Women																				
Moderately active	2	4	2	4	3	0	1	12	3½	2	0	5	0	6	3	8	0	14	0	14
Very active. . .	2	8	2	8	4	0	2	0	4	2	0	5	0	8	4	8	1	0	1	0
Sedentary. . . .	2	0	2	0	2	8	1	8	3½	2	0	5	0	4	2	12	0	10	0	12
Pregnant[5][6] . . .	3	0	3	0	2	8	2	0	7½	2	8	7	0	4	3	0	0	8	0	8
Nursing[5][6]. . . .	3	8	3	8	4	0	2	4	10½	2	8	7	0	6	3	0	0	10	0	8
60 years or over[7]	2	8	2	4	2	12	1	12	4	2	0	5	0	2	2	12	0	10	0	8
Men																				
Moderately active	2	8	2	8	4	0	2	0	4	2	0	5	0	8	4	8	1	0	1	0
Very active. . .	2	12	2	8	6	0	2	8	4½	2	0	5	0	12	7	12	1	14	1	0
Sedentary. . . .	2	4	2	4	3	0	1	12	3½	2	0	5	0	6	3	8	0	14	0	14
60 years or over[7]	2	8	2	8	3	4	2	0	4	2	0	5	0	4	3	8	0	12	0	12

FAMILY FOOD PLAN AT MODERATE COST

Children (under 12)	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.	Qt.	Lb.	Oz.	No.	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.
9–12 months[4] . .	1	8	2	0	0	8	0	8	7	0	2	5			0	8	0	1	0	1
1–3 years[5][6] . .	2	0	2	0	0	8	1	4	6	0	12	6	0	1	1	4	0	2	0	2
4–6 years. . . .	2	4	2	4	1	0	2	4	6	1	4	7	0	1	1	8	0	6	0	8
7–9 years. . . .	2	12	2	8	1	12	2	8	6½	1	12	7	0	2	2	0	0	8	0	12
10–12 years. . .	2	12	2	12	2	4	2	8	7	2	4	7	0	2	2	12	0	12	0	14
Girls																				
13–15 years[6] . .	3	0	2	12	2	8	3	0	7	2	12	7	0	2	2	12	0	14	0	14
16–20 years[6] . .	3	0	2	12	2	8	3	0	6	2	12	7	0	2	2	8	0	12	0	14
Boys																				
13–15 years. . .	3	4	3	0	3	8	3	4	7	3	0	7	0	4	4	0	1	0	1	2
16–20 years . .	3	8	3	4	4	8	4	0	7	3	4	7	0	6	5	4	1	6	1	4
Women																				
Moderately active	3	8	2	12	2	8	4	0	4½	2	12	7	0	4	2	12	0	14	0	14
Very active. . .	3	12	3	0	3	4	4	4	5	3	0	7	0	4	3	12	1	0	1	2
Sedentary. . . .	3	8	2	12	2	0	3	8	4½	2	8	7	0	2	2	0	0	10	0	14
Pregnant[5][6] . . .	4	0	3	8	2	4	3	0	8	3	0	7	0	2	2	8	0	10	0	10
Nursing[5][6]. . . .	4	0	4	0	3	0	4	0	11	3	0	7	0	4	2	8	0	12	0	12
60 years or over[7]	3	8	2	12	2	4	3	8	5	2	4	7	0	1	2	0	0	10	0	10
Men																				
Moderately active	3	12	3	0	3	4	4	4	5	3	0	7	0	4	3	12	1	0	1	2
Very active. . .	4	0	3	8	5	0	4	8	5½	3	8	7	0	6	7	0	2	0	1	4
Sedentary. . . .	3	8	2	12	2	8	4	0	4½	2	12	7	0	4	2	12	0	14	0	14
60 years or over[7]	3	8	2	12	2	12	3	8	5	2	12	7	0	2	3	0	0	12	0	12

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[1] Or its equivalent in cheese, evaporated milk, or dry milk.

[2] Count 1½ pounds of bread as 1 pound of flour.

[3] For small children and pregnant and nursing women, cod-liver oil or some other source of vitamin D is also needed.

[4] To meet iron allowance, some fortified cereal is recommended.

[5] To meet iron and B-vitamin allowances, most of the suggested quantity of cereal products should be whole grain or enriched.

[6] To meet iron allowance, one large or two small servings of liver or other organ meats should be served each week.

[7] The nutritive content of the weekly food quantities for a man and woman sixty years or over were based on the National Research Council's recommended daily allowances for the sedentary man and woman.

TABLE VI · *Handy Guide to Your Food Groups*[1]

What's in Each Group	How to Figure Servings
Milk Fresh, evaporated, dried, or as cheese, buttermilk, cream, or ice cream.	Use at least this much every day: For a child, 3 to 4 cups; an expectant mother, 4 cups; a nursing mother, 6 cups; other adults, about 3 cups. (A quart of fluid milk makes 4 cups.) The following can be counted the same as a quart of fluid whole milk: 17 ounces (by weight) evaporated milk. 1 quart skim milk and 1½ ounces (3 tablespoons) butter. 5 ounces (about ⅓ pound) American cheese.
Potatoes, Sweet Potatoes	Serve 11 or 12 times a week by low-cost plan; 9 or 10 times by moderate-cost plan. One pound makes 3 or 4 servings.
Dry Beans and Peas, Nuts Including soybeans and soya products, cowpeas, lentils, peanut butter.	Serve 3 or 4 times a week by low-cost plan; 1 or 2 times by moderate-cost plan. One pound (2 cups) of dry beans or peas equals 5 to 6 cups when cooked and makes 8 to 10 servings.
Citrus Fruit, Tomatoes Oranges, grapefruit, tangerines, other citrus fruit, and tomatoes . . . fresh or canned.	Serve at least this often: A child under 4, once a day; an expectant mother, 6 or 7 times a week; a nursing mother once or twice a day; others in the family, 4 or 5 times a week. Number of servings to the pound: Fresh oranges or grapefruit "as is" or juiced—2 to 3. Canned oranges or grapefruit in sections or as juice—about 4. Fresh tomatoes—3 to 4. Canned tomatoes, whole or as juice—about 4. There's more vitamin C in citrus fruit than in tomatoes. So, if you use all tomatoes, use half again as much as the weekly list recommends.
Green and Yellow Vegetables Many kinds . . . such as collards, kale, spinach, other greens, cultivated and wild . . . carrots, peas, okra, green asparagus, broccoli, pumpkin, snap beans, yellow squash, green cabbage.	Serve 6 or 7 times a week by low-cost plan; 12 times by moderate-cost plan. Number of servings to the pound: Kale, spinach, fresh peas or lima beans, pumpkin, yellow squash—2 to 3. Head lettuce, red or green peppers—5. Leaf lettuce, raw salad greens—8. Canned or frozen limas, green snap beans, peas, carrots—4.
Other Vegetables, Fruit Beets, cauliflower, cucumbers, corn, onions, sauerkraut, turnips, apples, bananas, berries, peaches, rhubarb, dried fruits—all the vegetables and fruits not included in other groups.	Serve 8 or 9 times a week by low-cost plan; 12 or 13 times by moderate-cost plan. One pound of fresh fruit and vegetables makes 3 to 4 servings. One pound of dried fruit makes about 10 servings.

[1] Bureau of Human Nutrition and Home Economics, *Family Food Plans*, AWI–78. United States Department of Agriculture, May, 1948. (Out of print.)

Table VI · *Handy Guide to Your Food Groups*

What's in Each Group	How to Figure Servings
Eggs	Serve 4 or 5 a week for each person by low-cost plan; 5 or 6 by moderate-cost plan. Use eggs more liberally if you have your own hens, or when eggs are cheap.
Lean Meat, Fish, Poultry All kinds, including liver, heart, and other variety meats. Count bacon and salt side in with fats.	Serve 5 or 6 times a week by low-cost plan; 7 or 8 times by moderate-cost plan. One pound of cuts with bone, such as chops, rib roasts, poultry, or whole fish, makes 2 to 3 servings. One pound of boned or boneless cuts makes about 4 servings; ground meat, 5 servings. One pound of ready-to-eat meats makes 6 or more servings.
Flour, Cereals Flour or meal made from any grain—wheat, buckwheat, rye—cooked cereals, ready-to-eat cereals, rice, hominy, noodles, macaroni, breads.	Serve bread at every meal, and also a cereal food once or sometimes twice a day. Whole-grain, enriched, or restored products are best choices. One-pound loaf of bread makes 18 to 20 slices.
Fats, Oils Butter, oleomargarine, salad oils, suet, shortening, lard, bacon, salt side, meat drippings.	"Spread" your fats for cooking and table use, so as to make meals appetizing and give them a stick-to-the-ribs quality. You don't need to figure exact servings.
Sugar, Sirups, Preserves Including any kind of sugar—beet, cane, corn, maple, and brown—molasses or any kind of sirup or honey, jams and jellies, candy.	Quantities in the weekly plans provide for table and cooking use. You may need more for canning and preserving.

TABLE VII (Part I) · *Weekly Market Order for Family of Two*[1]

KINDS OF FOOD WE USE	WEEKLY PLAN FOR TWO (approximate amounts)	A SAMPLE WEEKLY SHOPPING ORDER FOR TWO
Green and Yellow Vegetables At least once a day	7 to 8 pounds	1 head lettuce 1 lb. snap beans 1 lb. squash 1 bunch carrots 1 bunch broccoli 1 lb. kale 1 pkg. peas (frozen)
Citrus Fruit, Tomatoes Once daily if possible	4 to 6 pounds	1 doz. oranges 1 can tomatoes 1 grapefruit
Potatoes, Sweet Potatoes One or more servings daily	5 pounds	1 lb. sweet potatoes 4 lb. potatoes
Other Vegetables, Fruit One to two servings daily	8 to 9 pounds	2 lb. apples 1 lb. other fruit ½ lb. raisins 1 No. 1 can veg. soup 1 head cabbage (small) 1 lb. turnips 1 lb. onions 1 bunch celery
Milk, Cheese 2 to 3 times daily and in cooking	9 to 10 quarts (1 ounce cheese or 2 to 3 large dips ice cream equal 1 cup milk)	8 qt. fresh whole milk ¼ lb. cheese 1 pt. ice cream
Meat, Poultry, Fish Once daily, if possible	5 to 6 pounds	½ lb. liver 1 lb. hamburg 3 lb. roasting chicken or shoulder of lamb 1 lb. fish
Eggs Four or more a week per person	1 dozen	1 dozen eggs
Dry Beans and Peas, Nuts One to four times a week	½ pound	½ lb. beans, soybeans, or nuts
Flour, Cereals, Meal (Whole-grain or enriched are best) At every meal	6 to 7 pounds (Count 1½ lb. bread as 1 lb. flour)	2 loaves enriched white bread 1 loaf whole-wheat bread 1 loaf rye bread 1½ lb. rolled oats or ready-to-eat cereal 1½ lb. flour, ½ lb. cornmeal or rice
Fats, Oils Some daily	2 pounds	1 lb. table fat ½ lb. shortening ½ pt. salad dressing or salad oil
Sugar, Sirup, Preserves Some daily	1½ pounds	½ to 1 lb. sugar ½ to 1 pt. molasses, jelly, or preserves

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[1] Taken from *Food for Two*, AIS–21, United States Department of Agriculture (1945).

TABLE VII (Part II) · *Weekly Market Order for Family of Four (Two Children)*[1]

WEEKLY PLAN FOR FOUR (approximate amounts)	A SAMPLE WEEKLY SHOPPING ORDER FOR FOUR	
11 to 12 pounds	2 heads lettuce 1½ lb. snap beans 2 bunches carrots 2½ lb. spinach	1 lb. squash 1 head cabbage (small) 1 No. 2 can green peas 1 pkg. green lima beans (frozen)
8 to 10 pounds	4½ to 5 lb. oranges 2 grapefruit	1 46-oz. can tomato juice 2 or 3 lemons or 1 small can lemon juice
6½ to 8 pounds	2 lb. sweet potatoes	6 lb. potatoes
12 to 13 pounds	2 lb. apples 1 No. 2 can applesauce 1 No. 2½ can peaches 1 lb. prunes, ½ lb. raisins	3 lb. other fruit 1 bunch celery 1 lb. beets 1 lb. onions
19 to 21 quarts (1 ounce cheese or 2 to 3 dips ice cream equal 1 cup milk)	17 qt. fresh whole milk 1 14½-oz. can evaporated milk	¼ lb. Cheddar cheese ½ to 1 lb. cottage cheese 1 pt. ice cream
7 to 8 pounds	¾ lb. liver 1 lb. fish (haddock, cod, halibut)	3 to 3½ lb. beef chuck 2 to 3 lb. lamb shoulder
2 dozen	2 dozen eggs	
12 ounces or ¾ pound	8 oz. split peas 4 oz. peanut butter	
9 to 10 pounds (Count 1½ lb. bread as 1 lb. flour)	3 loaves enriched bread 3 loaves whole-wheat bread 1 loaf rye bread 1¼ lb. rolled oats or whole-wheat cereal	1 small pkg. cereal 1 lb. enriched flour ½ lb. macaroni 1 box crackers
2½ to 3 pounds	½ lb. bacon 1½ lb. table fat	½ lb. shortening ½ pt. salad oil
2¾ to 3 pounds	1½ to 2 lb. sugar ½ to 1 pt. molasses	honey, jelly, or preserves

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[1] Taken from *Food for the Family with Young Children*, AIS–59, United States Department of Agriculture (1946).

II · Sugars and Sugar Cookery

The sugars are the simplest of the organic foods. Green plants build them from the carbon dioxide of the air and the water of the soil. Simple food sugars contain in each molecule six atoms of carbon combined with twelve atoms of hydrogen and six of oxygen — the latter two in the same proportion as in water. These are called **monosaccharides.** More complex food carbohydrates are formed in multiples of these simple units called **disaccharides** or **polysaccharides,** depending upon the number of the simple units contained.

Since all the food carbohydrates—the food sugars, dextrins, starches, and celluloses—are made up of units containing six atoms of carbon, they are called **hexoses.** Carbohydrates built from simple sugars containing only five carbon atoms are **pentoses.** While pentoses are present in small amounts in foods, the human digestive tract contains no enzyme to digest them; consequently they are not usable as food.

CLASSIFICATION OF SUGARS

Food sugars are carbohydrates characterized by a sweet taste. There are two groups of food sugars.

Monosaccharides. Monosaccharides, the simple food sugars, are dextrose, levulose, and galactose. The first two are more abundant than galactose since they are the simple units built into the carbohydrates of food plants. Galactose is one of the two simple sugars in lactose, the sugar in milk. The chemical formula for these sugars is the same, $C_6H_{12}O_6$, but these elements are so combined in the different sugars that their structural formulas and properties differ.

While dextrose and levulose are very abundant in fruits and sirups, they are not readily available in a pure crystalline form like sucrose, the granulated sugar of commerce, but are used in the form of sirups, most of which contain mixtures of sugars.

Dextrose is the simple sugar that plants build into starch. Another name for this sugar is *glucose.* Dextrose is less soluble in water and crystallizes more readily than levulose. It forms very small crystals.

Manufacturers now reverse the process by which plants form starch and make from starch a sweet sirup, known as commercial glucose. In the United States this is commonly called corn sirup even when prepared from other starches since it is frequently made from cornstarch. It can be prepared equally well from any of the starches. This change is not complete, and the resulting sirups are not pure dextrose but mixtures of dextrose, maltose, and dextrins. (See cerelose, p. 30.)

Levulose occurs most abundantly in fruit and for this reason is sometimes called fructose or fruit sugar. It is present also in sirups, honey being an especially rich source. Levulose is more soluble than dextrose and crystallizes with difficulty and so is rarely available in crystalline form. It can be produced from inulin, a starch-like carbohydrate which is built in some plants from levulose instead of dextrose. Artichokes and certain other tubers contain inulin instead of starch.

Galactose does not occur in foods in free form. It is one of the simple sugar components of lactose discussed below.

Disaccharides. The disaccharides are composed of two molecules of simple sugars. These combine, giving off one molecule of water as indicated by the following equation:

$$2(C_6H_{12}O_6) = C_{12}H_{22}O_{11} + H_2O$$

The disaccharides occurring in food are maltose, lactose, and sucrose.

Maltose is composed of two molecules of glucose. It does not crystallize readily and is therefore rarely seen in pure form. It is present in commercial glucose, in small amounts in cerelose, and in dextro-maltose, which is sometimes used in infant feeding.

Lactose is the sugar found in milk. It yields a molecule of dextrose and one of galactose, a sugar not found in any quantity in any other foodstuff.

Sucrose, formed from one molecule of levulose and one of dextrose, is the sugar generally available in pure form. It occurs naturally in many plants and is especially concentrated in sugar cane, sugar beets, and maple sap. It crystallizes readily and so is easily separated from the plant sap or extracted juice. This sugar is available commercially in various forms. Granulated sugar, the form most used, is unmixed with any other material and, practically speaking, is chemically pure. For this reason sugar cookery is a good starting point for a study of the chemical and physical changes brought about when heat is applied to food constituents. In making candy the action of moist and dry heat on sugar may be studied, and the influence of these changes noted. The basic principles of sugar cookery worked out in this way can be applied when sugar is used in more complex mixtures.

SOURCES AND MARKET FORMS

Plants that store energy in the form of sugar—sugar canes, beets, and sugar maples—are the richest sources of sucrose, or granulated sugar. A less sweet crystalline mixture of sugars known as cerelose is manufactured from starch. Sirups, both natural and manufactured, are important sources of sugars; usually they are mixtures of sugars.

Granulated Sugar. Granulated sugar frequently is called cane sugar, since, for many years, sugar cane was its important source. Sugar identical in chemical composition with cane sugar now is separated from the sugar beet; and the two may be used interchangeably. Maple sugar is a less purified form of sucrose prepared from the sap of the sugar maple. When sucrose sirups are boiled, the sucrose is broken down into its simple sugar components, levulose and dextrose. Then it is said to be inverted. This mixture is called invert sugar. The change is hastened by the addition of an acid.

The high degree of purity of granulated sugar is due to the readiness with which it crystallizes. In the separation of sugar from either cane or beets the process is essentially the same. The sugar is removed from the pulp or fiber by solution in warm water and extraction under pressure. The extracted juice is clarified and concentrated and the sugar allowed to crystallize. The crystals are separated from the mother liquid by a centrifuge, washed, sifted, and dried. Repeated crystallization or chemical precipitation may be necessary to separate the sucrose completely.

The thick sirup left after the sucrose crystals have been removed from the concentrated cane juice is known as molasses. It contains any soluble mineral constituents of the sap not removed during clarification, and the invert sugar formed in concentrating the juice. Invert sugar does not crystallize readily. Molasses also contains small amounts of sucrose prevented from crystallizing by the presence of other sugars, and some caramel and other products formed by the breaking down of the sugars.

The composition of the mother liquid left after the removal of the sucrose from the beet sirup is such as to render it unpalatable. Any sugar remaining after the first crystallization is usually precipitated directly by chemical means rather than by repeated crystallization.

On the market, sugars are given commercial designations that indicate the degree of refining, the size of the crystals, and the form in which they are sold.

Brown Sugar. Brown sugar and maple sugar, while largely sucrose, are not fully refined. The mother liquor left in gives them a characteristic flavor and color. This flavor is responsible for the demand for maple sugar. Brown sugars are classified as light, medium, and dark brown according to the degree of refining and the resulting color.

The size of the sucrose crystals can be controlled by appropriate regulation of the crystallization. By management of this step the manufacturer is able to obtain uniform crystals of the size desired. The major portion of sucrose is sold as "granulated sugar," which has distinct crystals.

Powdered Sugar. Powdered sugar is a pulverized granulated sugar. It is available as "standard powdered" and as finer products, designated as "confectioner's sugars." The degree of fineness of these is indicated by the number of X's following the name. XXXX or XXXXXX sugars are on the consumer market, and even finer grades are available to industrial consumers. These fine sugars are used in the preparation of uncooked confections and icings for cakes and breads.

Lump Sugar. Cube and domino sugars are formed by pressing the hot crystals as they come from the centrifuge into molds and adding a saturated sugar solution. After hardening, the cakes are cut into pieces of the desired size.

In choosing sugar for cooking processes, the size of the crystals is unimportant if the sugar is to be dissolved in a hot liquid. Any white sucrose will form the same solution irrespective of the size of the crystals, provided equal proportions by weight are used. The smaller the crystals the more readily they dissolve, and on this account small crystals are desirable for use in cold liquids such as iced tea. Small crystals are preferred with fresh fruit. Lump sugar frequently is served with hot drinks, in which it dissolves quickly.

Loaf Sugar. English recipes sometimes call for "loaf sugar." This name is a survival of the time when the crystallizing sugar was run into conical molds perforated at the bottom to allow the escape of the molasses. The crystals were washed, and the mass, cooled in the mold, retained its shape. It frequently was sold in this form, which was preferred because the loaf form did not permit adulteration at a time when loose crystals of sugar frequently were sanded. It has no advantages over any pure sugar now that consumers are protected by pure food laws and fair-trade-practice regulations.

Cerelose. Cerelose is a dry, crystalline product prepared from corn sirup. In its preparation the digestion of the starch is so handled that a high proportion of dextrose is obtained, which facilitates crystallization. Some maltose and dextrins also are present. Cerelose is less sweet than "granulated sugar." It is rarely available on the consumer market but has extensive uses in industrial food preparation and processing.

Sirups. Sirups are important sources of sugars. They are used as spreads on bread, in beverages, in candymaking, and in cooking. The fluid form of sirups increases the cost of distribution so that in general they are a more expensive source of sugar than the more concentrated and easily packaged crystallized forms. Some sirups have special flavors and other characteristics which add to their desirability and convenience for special uses.

Sirups contain from 34 to 70 per cent total sugar, in most cases a mixture of sugars. Maple sirup may contain 65 per cent sucrose. Honey is a mixture of dextrose and levulose, with only a small amount of sucrose. The composition of the more important sirups is shown in Table VIII. The sources of the various sirups are discussed below.

Cane sugar sirup is the clarified, concentrated juice of sugar cane. It contains from 65 to 70 per cent sugar. This concentration is sufficiently high to preserve the sirup but not high enough to cause crystallization. Since the evaporation is carried out in open pans, there is some caramelization. This gives a red-brown color to the sirup. Where the trade demands a light-colored product, the sirups are bleached by sulfur fumes. This improves the color of the sirup but remaining traces of sulfur dioxide may mask its distinctive flavor.

Molasses is a by-product from the manufacture of sugar, in contrast to cane sirup which is an end-product in itself. New Orleans molasses, rarely seen now, was obtained by a former method of manufacturing sugar, in which the juice was concentrated in open pans. The raw sugar resulting from this concentration was placed in a hogshead, the botton of which was pierced with holes and covered with straw. As broken masses of raw sugar pressed down the liquid portion, the molasses seeped through, leaving the solid crystalline sugar in the cask.

The modern method of sugar manufacture, which increases the yield of sugar, produces molasses of different qualities. The juice is now concentrated in vacuum pans instead of open kettles. After crystallization the sugar is separated from the sirup by the centrifuge. The molasses obtained as the result of the first crystallization is rich in sucrose. Additional sugar can be obtained by further concentration and separation. By this procedure three grades of molasses are produced, in which there are successive decreases in the amount of cane sugar present, and corresponding increases in the invert sugar and mineral constituents. The composition of the three grades of molasses is given in Table VIII.

Sorghum is the concentrated juice from sorghum cane. It is lighter in color than cane-sugar sirup and has a greenish tinge. The flavor is characteristic and is very much liked by those accustomed to it. A large propor-

Table VIII · *Approximate Composition of Typical Sirups*

SIRUP	WATER	SUCROSE	MALTOSE	REDUCING SUGARS		TOTAL SUGARS	DEXTRINS AND HIGHER SUGARS[1]	ASH
				Dextrose	Levulose			
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Cane	27					67		1.5
Corn sirup . . .	19.7		16.6	17.6		34.2	45.8	.3
Sweetose	18.2		27.9	30.6		58.2	23.00	.3
Honey	20	2		34	40	76		.2
Maple sirup . . .	34	62.5			1.5	64		.7
Molasses: Light. .	24					70		3
Medium . . .	24					66		4.5
Dark	24					65		5
Sorghum	23	38.0		29.0		67		2.5

[1] NOT included in total sugars.

tion of the sugar in sorghum sirup is in the form of invert sugar, which makes the separation of sucrose from sorghum impracticable.

Maple sirup results from the concentration of the sap of the sugar maple. The sugar in this sap is largely in the form of sucrose. If the sap is concentrated too far the sucrose tends to crystallize and separate. Also some of the essential oils which give the characteristic flavors to maple sirup are volatilized. For these reasons, the manufacturers tend to produce a sirup with a total solid content of 68 per cent, the minimum allowed under the standard for maple sirup. The total sugar is often not more than 64 per cent. In buying maple sirup, buyers consider flavor, rather than sugar content.

Corn sirup or commercial glucose is manufactured by heating starch in dilute acid solutions. This sirup is not composed entirely of glucose or dextrose but contains maltose and dextrins, the relative amounts depending upon the length of time the acid has been allowed to act on the starch.

The discovery of the chemical relation of starch to glucose and of the method of its preparation from starch is a very interesting one, especially in its historical setting. In 1811 the nations of Europe were engaged in a conflict almost as general and bitter as the First World War. Since 1803, Napoleon had declared an embargo against England and her colonies, cutting off normal sources of sugar.

A young German chemist, Kirchoff, was engaged in an industrial research which required the use of gum arabic. Dextrin, a carbohydrate very similar to gum arabic in physical properties, had been prepared from starch as early as 1804 by the action of dry heat. Kirchoff made an attempt to prepare dextrin as a substitute for the gum arabic needed in his experiments. In order to prevent the discoloration which inevitably occurs in the preparation of dextrin from starch by the use of dry heat, he tried to prepare it by the use of moist heat in the presence of acid. The change was allowed to proceed too far; after neutralization of the acid, filtration and concentration of the resulting liquid, a sweetish sirup resulted instead of the gummy one expected. This accidental discovery of glucose was of great importance to the warring European countries. They had little sugar but an abundance of potato starch from which glucose could be prepared.

This same process, modernized and very much improved, is the basis of an extensive industry in this country which puts these sirups on the market in various forms. Glucose sirup, which commonly goes under the name of "corn sirup," is less sweet than the sirups which contain sucrose and levulose. Corn sirup in the consumer package usually has added sucrose.

Sweetose is the trade name of a corn sirup prepared by using an enzyme instead of the usual acid digestion to break down the starch to the simple sugars. Sweetose contains more dextrose than corn sirup, is sweeter, less viscous, and more suitable for certain uses in food preparation than ordinary corn sirup.

Mixed table sirups are prepared with commercial glucose as a base. Other sirups are added to commercial glucose for flavor. In some cases, only enough sucrose or cane sirup is used to sweeten the product. The sirups may be colored with caramel, and synthetic flavors may be added. When glucose is used as a base for, or is added to, other sirups, they must be labeled "mixed table sirups." These mixed sirups do not contain the minerals present in some natural sirups.

Honey is the sirup which bees make from the nectar of flowers and deposit for winter use in the familar wax comb. At first, the honey was available only from the storage places of wild bees. Now bees have been domesticated, and beekeeping is an important industry. Honey is defined as "the nectar and saccharine exudations of plants, gathered, modified, and stored by the honey bee."

Honey is available on the market in three forms: comb honey, extracted honey, and strained honey. There was formerly a prejudice in favor of comb honey because it was less likely to be adulterated. The operation of the pure-food laws has made the adulteration of honey more difficult than formerly, and has restored confidence in the extracted form. This is the economical form in which to buy honey because of the greater ease of transportation, and the extra yield of honey which results when artificial combs are supplied to the hive. This saves the bees the work of making the wax. Wax is made and secreted from special glands in the abdomen of the worker bee. Several pounds of honey are used by the bee in the production of a pound of wax.

Honey is extracted by cutting or shaving off one side of the comb so as to release the honey from the individual cells. The combs then are placed in a special extractor in which they are rotated, so that the honey is thrown out by centrifugal force. Strained honey is obtained by crushing the comb and straining out the honey. Usually some heat is required.

Honey varies in flavor and color, depending upon the flowers from which it is made. Some of the more common flavors are clover, alfalfa, orange blossom, buckwheat, and spanish needle. The white or light-colored honey, such as that from alfalfa and white clover, has a mild flavor and delicate aroma preferred by many people; those who are accustomed to the dark, stronger-flavored honey prefer that kind.

Honey is valued for its flavor. It contains about four parts sugar to one part water. About two per cent of the sugar is in the form of sucrose, while the remainder is made up of varying amounts of dextrose and levulose, depending upon the proportion of these two sugars in the nectar from which the honey is made. When the levulose content is high, the honey is sweeter than sucrose. When the proportion of dextrose is high, as it sometimes is in alfalfa honey, the honey may crystallize. It occasionally sets into a cake sufficiently solid to be sold in that form. Aside from the energy which is obtained from the sugar in honey, appreciable amounts of mineral matter are present.

The most economical form in which to buy honey is the extracted product in large containers. In the small containers often seen on the retail market, the price of the honey per pound is materially increased.

Honey is largely used as a spread with bread. When extracted honey is available in large containers, considerable use is made of it in cooking. This is discussed later in appropriate chapters.

The compositions of typical sirups are shown in Table VIII (p. 31).

SUGAR IN DIET

The nutritive contribution of sugars is as a source of energy. Like other carbohydrates, they yield four calories of energy for each gram, or approximately 1800 calories for each pound. At the usual price of sugar, this is a very economical form in which to obtain energy.

Three points should be borne in mind regarding the use of sugar in the diet:

1. The body needs building material and other necessary food nutrients as well as energy. The essential minerals and vitamins must be obtained in part from the energy-yielding foods. Purified sugars are a concentrated source of energy, and furnish no building or regulating materials, and therefore should not make up too large a proportion of the diet. Some sirups contain minerals and vitamins, but they are not present in large amounts.

2. Sugar has condimental value. Its sweet flavor has an almost universal appeal. This can be used to advantage in making other food more attractive, but care must be taken lest it be consumed in too great quantity because of its desirable flavor.

3. Sugar is digested and absorbed rapidly. This is an advantage when immediate energy is needed. However, this quick absorption dulls the appetite. For this reason very sweet dishes should be used sparingly in the first portion of the meal. When the morning cereal is heaped with sugar the remainder of the meal frequently is neglected. The child who eats sweets before mealtime too often goes to the table with little appetite and does not eat the foods containing the essential building materials. The time for sweets and sugar-rich foods is at dessert or long enough before a meal so as not to interfere with a good mealtime appetite.

SUGAR-SIRUP EQUIVALENTS

The substitution of a sirup for all or a part of the granulated sugar in a recipe must be made on the basis of the contribution of the sugar to that recipe. On the basis of the amount of total sugar, or calorie content, substitutions are made in terms of the amount of sirup containing the same weight of total sugar as one cup of granulated sugar. In general, a cup of sirup contains the same weight of total sugar as a cup of dry sugar. This is due to the heaviness of sirups as compared with an equal measure of sugar. See Table IX.

On the basis of sweetness, the amounts of the sirups comparable to a cup of granulated sugar depend upon the kinds of sugar in the sirup as well as the amounts. Sweetness varies with the different sugars. The degree of sweetness is difficult to measure accurately. A number of investigators, however, have rated the different sugars according to sweetness. All agree that levulose is the sweetest of the sugars, but since no method has been perfected for producing this sugar in an inexpensive, crystalline form, it is not readily available except in sirups. All the other sugars are less sweet than sucrose, dextrose being rated by the various investigators as from one-half to three-fourths as sweet as sucrose. Maltose is still less sweet than dextrose, and lactose, or milk sugar, the least sweet of all. These ratings resulted from studies made with dilute solutions. With concentrated solutions the ranking given above is in general the same, but the percentage ratings are somewhat different. The combined sweetness of two or more sugars in a solution seem greater than the sum of their separate sweetnesses.

The measures of sirups that give approximately the same total sugar and the same sweetening value as one cup of granulated sugar are given in Table IX.

Sugar in the form of sirups costs more than granulated sugar, at usual prices for sirups in retail packages. Some sirups contribute flavor as well as sweetness, and the natural sirups may be sources of nutrients lacking in granulated sugar. Certain sirups

TABLE IX · *Sugar-Sirup Equivalents*

Kind of Sugar or Sirup	Weight of One Cup	Total Sugar	Kinds of Sugar Present	Weight Total Sugar in One Cup	Calories in One Cup	Approximate Measure to Give Same Sweetness
	Grams	*Per cent*		*Grams*		*Cups*
Granulated sugar	200	100	Sucrose	200	796	1
Corn sirup	392	34.2	Dextrose; maltose	100	853	3
Sweetose	336	58.2	Dextrose; maltose	195	994	1½–2
Honey	333	76	Sucrose; levulose	253	1062	¾

have special advantages in food preparation. Corn sirups are widely used in the industrial preparation of food. The form of distribution to industrial users makes it possible for corn sirups to compete in price with sucrose.

SUGAR COOKERY

Sugar is a component of many cooked foods. It sweetens many kinds of desserts and preserves and flavors fruits, jams, and jellies. In candy, however, sugar is the basic ingredient. An understanding of the principles of sugar cookery simplifies candymaking. These principles explain the reasons for the rules and directions usually given for making candy.

The usefulness of sucrose in cookery is due in part to the ease with which it is dissolved in water and the amount that will dissolve in a given volume, or its solubility. A solution is said to be saturated when the solvent has taken up all of any substance it will dissolve. The higher the temperature of the water the more sugar it will dissolve.

At room temperature water will dissolve more than twice its weight of sucrose (four times its volume). At boiling point twice this amount of sugar will be dissolved. Levulose is more soluble in water than sucrose, and dextrose is less soluble. Maltose is less soluble than dextrose and tends to separate out in small crystals from concentrated solution. Corn sirup and corn sugar made from it which contain mixtures of maltose and dextrose are about half as soluble as sucrose. One part of water will dissolve one part of the corn sugar formerly made.

The lower solubility of the sugars in this sirup limited its usefulness in highly concentrated mixtures like jellies and preserves which average 60–70 per cent sugar. It tended to crystallize and formed a white crust over the surface on standing. This has been corrected in sweetose and cerelose, the corn sugar now on the market. This corn sugar contains a higher percentage of dextrose and has a somewhat higher solubility.

Effect of Dry Heat. When granulated sugar (sucrose) is heated without the addition of any liquid, it melts and forms a clear mass without any crystals. Substances in this form are said to be "amorphous" as opposed to crystalline. Amorphous means "without form." Crystals have definite forms that are typical for the particular substance from which they are formed.

Barley sugar is prepared by the careful heating of sucrose until it melts. If this melted sugar is cooled it forms a clear, hard cake. During the heating the water of crystallization has been driven off from the sugar crystals, with the result that this form of sugar does not crystallize.

Caramel is formed by continued heating of the melted sugar. More water is driven off and the sugar is decomposed, forming a substance of indefinite composition and distinctive flavor with a melting point of 347° F. If the melted mass of caramelized sugar is allowed to cool, it forms a hard, clear cake darker than barley sugar, with the flavor of slightly burned sugar.

In the household, caramel is used as flavoring. A clear brown sirup which can be saved for flavoring purposes can be made by adding boiling water to the melted caramel.

Cerelose can be melted. It melts at a lower temperature than sucrose, and therefore must be handled with special care.

Effect of Moist Heat. Other candies are prepared by dissolving sugar in a liquid and heating the sirup to facilitate the solution. The crystalline form of the sugar is lost and it combines readily with other sirups. As the heating continues above boiling, the water evaporates and the solution becomes more concentrated.

A basic problem in making candies with added liquid is to know when the sirup has

Taylor Instrument Company

Candy Thermometer · The boiling point of the sirup is a measure of the concentration. This sirup has not reached soft ball

reached the concentration desired or when the candy is "done." This is the point at which most amateur candymakers fail.

As the water boils off, the sirup becomes more concentrated and the boiling point rises. Water boils at 212° F., but if sucrose is dissolved in that water, the boiling point is raised. The rise in the boiling point is in direct proportion to the amount of sucrose dissolved in the water. Therefore the boiling temperature is a definite and satisfactory method of measuring the concentration of sirups. Any chemical thermometer can be used to measure the temperature at which a liquid boils. Special candy thermometers also are available.

In determining the boiling point the bulb of the thermometer should be completely immersed in the boiling sirup, not just inserted in the bubbles on top. It should not touch the pan at any point. To read the temperature accurately, the eye should be on a level with the point on the scale where the mercury stands.

The consistency of the sirup when poured into cold water, such as soft ball, hard ball, and crack, can be used to test concentration. This method is wasteful of material, and results are influenced by the temperature of the water. It is useful, however, in establishing the boiling points at which standard concentrations are reached. The boiling points of sucrose sirup corresponding to the common household test for consistency are given in Table X.

Different sugars affect the boiling point differently. When recipes use large amounts of sugar other than sucrose, the boiling point for that particular solution should be verified by use of the consistency test. This boiling point can be used in the future for that same recipe.

The influence of any substance on the boiling point is in proportion to the number of molecules present in a given volume of the solution. The dextrose molecule, like the other simple sugars, is half the size of the cane-sugar molecule. Dextrose or any of the simple sugars therefore will have twice the influence in raising the boiling point as the same weight of cane sugar. The rise in the boiling point at the soft-ball stage then would theoretically be twice as great with dextrose alone as with sucrose alone.

On the other hand, corn sirup contains some dextrin, which has a higher molecular weight than sucrose. Sirups made from a glucose sirup high in dextrins may contain fewer molecules per unit of weight than sirups made from sucrose. This would lower the boiling point.

This fact is recognized by professional candymakers. They warn against the danger of cooking candies containing commercial glucose to too high a temperature. The point at which such sirup darkens is about 20° F. below that of a sirup made from granulated sugar.

Control of Crystallization. The only candies in which the sugar is wanted in large crystals are rock candy and the cover coat of

TABLE X · ***Boiling Temperatures*[1] *of Sucrose Solutions of Varying Concentrations Corresponding to Household Tests***

Test	Temperature	
	°F.	°C.
Thread: when poured from spoon, sirup spins a two-inch thread	232	111
Soft ball: in ice water, sirup forms a soft ball which loses shape at room temperature	237	114
Firm ball: in ice water, sirup forms a firm ball which flattens at room temperature	244	118
Hard ball: in ice water, sirup forms a hard ball which retains its shape at room temperature	252	122
Soft crack: when poured into ice water, sirup separates into thread, hard but not brittle	280	137
Hard crack: when poured into ice water, sirup separates into threads which are hard and brittle	305	152
Melted sugar (Barley sugar):	320	160
(Caramel):	338	170

certain other candies. Rock candy is prepared by immersing a string in a concentrated cane-sugar solution. The sugar is deposited slowly upon the string in crystals which increase in size as long as they are immersed in a sugar-containing solution. Rock candy is used for chemistry experiments when very pure sucrose is needed.

Cream or texture candies may be coated with crystals by immersing them in a cold sugar solution. Two parts of sugar are dissolved in one part of water, and the solution is concentrated to a boiling point of 225° F. If candies are allowed to stand in this solution 12 to 24 hours, a coat of crystals is formed over the outside. This improves the appearance and the keeping quality of cream bonbons and gum drops.

Large crystals are obtained by use of sucrose sirups of low concentration. The crystals are allowed to form slowly until the desired size is obtained.

Cream candies present a special problem in crystallization. In this group of candies crystals are wanted, but small crystals that cannot be felt separately on the tongue. To obtain small crystals one must make sure that they are formed rapidly.

Cream candies are made from granulated sugar (sucrose). The sugar is dissolved in the liquid, water or milk. This breaks down its crystalline form. The sirup then is boiled until it reaches the soft-ball stage, indicated by a temperature of 237° F.

The object in cooking these candies is to obtain a sirup of such concentration and composition that the sugar will separate at once in very small crystals, or "cream." Sucrose crystallizes readily, so readily that precautions must be taken to prevent the process from starting too soon. When crystals are prematurely formed in sucrose solutions they grow slowly, with the result that large crystals form in the candy and it becomes grainy. To get a smooth, creamy candy, one must control conditions so as to prevent crystallization before the conditions are just right. Then rapid crystallization is started throughout the whole mass at one time by beating, or creaming. This causes the formation of a large number of small crystals, and since the sugar separates all at once, there is little opportunity for the crystals to grow.

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[1] These temperatures have been calculated for places with boiling points of 212° F. Where the boiling point of water is less than 212°, decrease the above temperatures by the difference between 212° and the actual boiling point at that location. This same correction should be made for the other temperatures in this chapter, if used where the boiling point of water is lower than 212° F.

The "just right" conditions are important to understand. The first of these is the presence of a small amount of simple sugar in the sirup. Simple sugars increase the viscosity of sucrose sirups, retard the early formation of crystals, and make it easier to obtain a creamy candy. Also, the presence of simple sugars prevents "lumping" of crystals after the fondant has creamed.

These simple sugars may be added in the form of corn sirup or honey. But since sucrose sirup forms invert sugar during boiling, and this change can be hastened by adding an acid, the proper control of cooking time and the use of acid give a satisfactory amount of simple sugar without added sirup. If too much corn sirup is added or too much sucrose inverted, the candy becomes sticky when beaten and will not cream. In general, the most satisfactory results are obtained in cream candies by the use of granulated sugar (sucrose) as the only sugar and the addition of a small amount of an easily measured acid, such as cream of tartar, to assure the inversion of just enough sucrose. The proportion of water to sugar should be kept constant. When the water is very hard, the amount of cream of tartar should be increased.

The second point is to have the sirup at just the right concentration. The right concentration is an almost saturated solution. This is the case when a very soft ball is obtained or the boiling point is 237° F. This sirup is poured out carefully on an oiled slab, or set aside in the cooking utensil to cool until it is a little above body temperature and feels barely warm to the hand.

As the sirup cools, the amount of sugar that it can hold in solution decreases, and it becomes supersaturated. When such a solution is beaten all the sugar crystallizes at one time, and a mass of small crystals is obtained.

In making uncrystallized candies the object is to prevent the formation of crystals. This result may be obtained from a sirup so concentrated that it does not crystallize readily. The presence of large amounts of simple sugars or other substances which separate the molecules of sucrose and thus interfere with the formation of crystals also prevents crystallization.

Uncrystallized candies are easier to make than cream candies. In cream candies there must be a definite proportion of simple to cane sugar at the end of the cooking time. Too little simple sugar means a grainy candy, too much means a failure to cream. In the uncrystallized candies, an important requirement is to have enough of the simple sugars; more does no harm. When granulated sugar is used alone, three or four times as much acid as that used in making cream candies is necessary. Sirups containing the simple sugars may be used to replace some or all of the granulated sugar.

The concentration must be definitely determined. The desired concentration varies with the different candies of this group from the caramels, which are fairly soft, through the salt-water taffies, to the brittle taffy and toffee which may be cooked to the crack stage.

Where large proportions of simple sugars are present, the boiling points given in Table X cannot be used as a measure of concentration of the solution. The boiling point at a given concentration will vary directly with both the amounts and kinds of sugars present. This causes no practical difficulty in cream candies, where the proportion of invert sugar to sucrose is fairly constant. In the uncrystallized candies, however, where there may be a wide variation in the kind of sugars used, it is necessary to check the end temperature for a given recipe very carefully by the consistency of the mass formed in cold water. This temperature will hold in the future for that same recipe, provided of course the forms of sugar and sirups are the same.

CANDYMAKING

The principles discussed above can be applied in the preparation of typical candies. Candies are classified as crystalline or noncrystalline on the basis of the form in which the sugars are present. The addition of other ingredients gives special textures to other candies.

Classification of Candies. All candies may be grouped under three heads: crystallized candies, uncrystallized candies, and special-texture candies. The following classification shows the basic candies in each group:

I. Candies in which sugar is present in the form of crystals
    1. Candies in which the sugar is present in large crystals (rock candy and the cover coat of certain other candies)
    2. Cream candies, in which the crystals are too small to be felt separately; therefore, the mixture is said to be creamy (fondant and fudge)

II. Candies in which the sugar is present in an uncrystallized, or amorphous, form
    1. Brittles (nut brittles, one type of nougat)
    2. Hard candies (some taffies, toffee, glacéed fruits and nuts, butterscotch)
    3. Soft candies (caramels, some taffies)

III. Candies given a special texture by the addition of egg white, gelatin, gum arabic, or pectin
    1. Spongy candies (divinity)
    2. Gummy candies (gumdrops, marshmallows, and fruit candies)

From the standpoint of methods of preparation, candies will be discussed under three heads: cream candies, uncrystallized candies, and special-texture candies.

Cream Candies. There are a number of popular cream candies. All follow the same general pattern with slight variations for flavor and texture.

Fondant is the simplest. To make a pound of fondant, use 1 pound sugar (2 cups), 1 cup water, and $\frac{1}{8}$ teaspoon cream of tartar (or 2 tablespoons glucose). The mixture should be stirred carefully while slowly heating, until all the crystals are completely dissolved. Any sugar crystals left will grow and form large crystals. After the sugar is completely dissolved, it is a good practice to cover the pan and allow the sirup to come to a heavy boil. The steam will wash any undissolved crystals from the sides. Then remove the cover and let the sirup boil, without stirring, to form an almost saturated solution. If any crystals form from the splashing of the sirup on the sides of the pan they should be wiped off carefully with a damp cloth wrapped around the prongs of a fork. Heat until the boiling point is 237° F. At this point the solution is almost saturated. It is then poured, without scraping the pan, onto a large platter or a slab and allowed to cool to 104° F. before it is beaten; or it may be cooled in the pan in which it is cooked, provided crystals have not been permitted to accumulate on the sides.

The beating should continue until crystallization is complete. At the beginning, the sirup is clear and viscous. It first becomes cloudy from the inclosed air, then opaque and thicker. As the crystals are formed it tends to soften, but as the "water of crystallization" is withdrawn from the solution, the mixture may set or harden quite suddenly. Then it should be kneaded to soften it. If the fondant is too hard, it has been cooked to too high a temperature.

When fondant cooked to the correct concentration fails to cream, the difficulty results from too much invert or simple sugar. This may be caused by too much acid, too slow cooking, or too much added sirup. The resultant sirup can be used to sweeten drinks, or in cookery, or in making an uncrystallized candy, but not in the preparation of a cream candy.

Fondant or any other of the cream candies should be stored in tightly covered containers to prevent their either drying out or absorbing moisture.

The consistency of fondant varies with room temperature. Fondant too soft to be handled at ordinary temperatures is easy to handle at low temperatures. For soft chocolate centers, the fondant is cooked to a temperature two or three degrees lower than usual. After creaming, the soft fondant is poured into molds and cooled until it solidifies. These soft centers must be dipped in chocolate or some firm cover while still cold. Soft-centered chocolates are prepared commercially by adding the enzyme invertase to the fondant before dipping in the chocolate. Then the chocolates are held at a suitable temperature for the invertase to change the sucrose to the softer invert sugar.

Different flavors may be worked into the fondant. Vanilla is the most usual flavoring, but almond, coffee, and maple flavor also are used. Maple sirup, butter, or cream used in the preparation of fondant gives special flavor and texture.

The flavored fondant may be molded plain or after the addition of nuts and dried or candied fruits. Molds of plain fondant may have a nut meat placed on top. Balls of soft fondant may be rolled in cinnamon, cocoa, chopped nuts, or grated coconut. Fondant mixtures are used to stuff dates.

For chocolate creams, plain or special fondant mixtures are coated by dipping in chocolate, either sweet or bitter. The chocolate should be melted (heated to 86° F.) and held as nearly as possible at this temperature. In hand dipping, the heat of the hand helps to keep the temperature of the chocolate right.

Coating with Chocolate · In hand dipping, the heat of the hand keeps the chocolate at the right temperature

U.S.D.A.

If the chocolate is allowed to get too hot the oil separates and the chocolate coating streaks.

Fondant with added fruit and nuts may be formed in loaves or sheets for slicing or cutting into squares. These pieces may be coated with chocolate.

Softened fondant is used to coat other fondant mixtures, grapes, or other small fruits. When fondant is softened for dipping, care must be taken to heat it just enough so that the candy or fruit can be coated smoothly. Both too high a temperature and unnecessary stirring should be avoided.

Mints are prepared by flavoring softened fondant with peppermint or wintergreen and dropping small amounts from a teaspoon onto oiled paper. The fondant should be soft enough to form a wafer, but not too thin.

Fudge is the cream candy most frequently made at home. Basically it is a fondant to which table fat is added for richness. While the flavor is usually chocolate, various other flavors are used. The simplest way to make fudge is to proceed as for fondant and carefully add the fat and the chocolate after the sirup is set aside to cool. The heat of the sirup is enough to melt them, and the sirup cools more rapidly.

Most recipes for fudge suggest the use of milk or cream as the liquid instead of water. The use of milk increases the food value of the fudge but the milk sometimes curdles. This can be avoided by the use of evaporated milk.

The basic ingredients for fudge are these: 2 cups sugar, 1 cup of liquid (water, milk, or evaporated milk); 2 ounces chocolate; 2 tablespoons butter or margarine; and $\frac{1}{8}$ teaspoon salt. 1 teaspoon vanilla is added at the end of cooking. All the ingredients except the fat, the vanilla, and possibly the chocolate are combined and cooked slowly with constant stirring, until the sugar is dissolved. If the chocolate has been added, it will melt and mix thoroughly with the sirup. Both chocolate and milk tend to stick and burn on the bottom of the pan; so the mixture must be cooked slowly with an occasional scraping across the bottom of the pan to make sure it is not sticking. This danger is avoided if the chocolate is added at the completion of the cooking.

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Dipping Cherries · Small fruits dipped in fondant make attractive bonbons

Cook to a boiling point of 237° F. (soft ball). After removal from the heat add fat, vanilla, and the chocolate if it has not been added earlier. Cool in the sauce pan to just above body temperature and beat until creamy. Then turn quickly into a square, greased pan, approximately 9 × 9 inches. Cut into squares immediately.

Fudges with distinctive flavors may be had by the substitution of brown sugar for all or part of the granulated sugar, by the caramelization of a portion of the sugar, or by the substitution of maple sugar or sirup for one third of the sugar, measure for measure. Chopped nuts, raisins, candied fruit, or marshmallows may be added to any of these fudges just as the candy begins to cream and before it is poured into the pan.

Panocha or pralines are made with the same basic proportions of sugar and liquid as fondant, with all brown sugar, or all granulated sugar with one third of it melted. The liquid is cream or top milk, and 2 tablespoons of butter or margarine are added. The distinctive flavor of this candy is developed by long, slow cooking of the milk or cream in the concentrated sugar sirup. For this reason the amount of milk or cream used is sometimes increased, and added in two or three portions. This prolongs the cooking time and gives temperature conditions in the boiling sirup that favor the development of the substance responsible for the characteristic flavor. Pecans are always added to panocha or pralines after creaming.

Uncrystallized Candies. The simplest uncrystallized candies are prepared by melting sugar. Usually nuts are added, making the nut brittles. In all other candies in this group, the sugar is dissolved in liquid and the sirup is concentrated.

To make **nut brittles**, place 2 cups granulated sugar in a heavy frying pan, nine to ten inches in diameter, and place over low heat. Stir carefully to prevent burning and to facilitate even melting. Use the back of the spoon for stirring to keep the melted sugar from caking in the bowl of the spoon. If hard lumps form, lower the heat so that the sugar mixture will keep warm but not burn. The low heat melts the lumps so that the sirup becomes smooth. Nuts, ½ to 1 cup, are added directly to the melted sugar, or the melted sugar is poured over the nuts in a greased pan with perpendicular sides. The candy should be marked off into even pieces before it becomes cold.

Baking soda in very small quantities is sometimes added to brittles. The acid in the melted sugar reacts with the soda to release carbon dioxide which gives the brittles a porous texture.

Brittle candies can be prepared by using cerelose or one of the sirups to replace all or some of the granulated sugar. When this is done the mixture must be handled more carefully and somewhat differently. When either granulated sugar or cerelose is combined with sirup, some water should be added and the mixture heated slowly so that the sugar will dissolve and mix evenly with the sirup. Then the solution is heated carefully to remove the added water, the water in the sirup, and the water of crystallization from the dry sugars. When either the barley sugar or caramel stage is reached, as preferred, pour the thick sirup over the nuts as directed above. The simple sugars melt at lower temperatures than sucrose.

Taffy may be made by adding more acid to the basic proportions of granulated sugar and water used in fondant; or some of the sucrose may be replaced by a sirup containing a simple sugar.

The first step is the same as in fondant, that is, the sugar must be completely dissolved. The sirup then is cooked to a hard-ball or a crack stage, depending upon whether a soft, chewy taffy or a brittle taffy is desired. Two tablespoons butter or margarine may be added after the candy is removed from the heat and vanilla or other flavoring added.

Taffies are cooled on a well-greased platter or slab and pulled as soon as cool enough to be handled. Pulling the taffy incorporates air. The candy becomes opaque and acquires a porous texture. When it becomes difficult to pull, lay it out in a long rope on a slab to cool. When cold, with greased scissors cut in pieces of the desired size.

In all taffies, the temperatures at which the desired consistency is reached will vary with the relative amounts of sucrose to sirup and, to a certain extent, with the kind of sirup. For example, a solution containing equal amounts of sucrose and corn sirup will have a boiling point of 246° F. at the hard-ball stage. When molasses is substituted for the corn sirup the boiling point will be 250° F. for the same consistency. For this reason it is necessary to check the end temperature for a given recipe by the consistency in cold water.

For **caramels** the basic proportions are 1 cup sucrose, 1 cup corn sirup, 1 cup liquid (top milk, cream, or evaporated milk), $\frac{1}{4}$ cup table fat, and 1 teaspoon vanilla, or 1 to 2 ounces chocolate for flavoring; nuts may be added as desired. All the ingredients, except vanilla and nuts if used, are combined and cooked over low heat, with careful stirring to prevent sticking, until the sirup forms a firm ball when tested in ice water (248° to 250° F.). Add flavoring or nuts and turn into a lightly greased pan. After cooling, cut into three-fourth inch squares and wrap each piece in oiled paper.

A distinctive flavor is given vanilla caramels if the top milk is added in two or three portions as suggested for panocha.

Special-Texture Candies. Candies of this group are given a special texture by the addition of egg white, gelatin, or pectin.

When egg white is used the sirup is added to the well-beaten whites. This process incorporates air and gives the candy a fluffy texture. The sugar is creamed as it is beaten into the egg white. The sirup, therefore, is cooked in the same way as for a cream candy. Since egg white contains water (85 per cent), which will dilute the sirup, it is necessary to cook the sirup to a higher concentration, to a hard ball instead of a soft ball. The usual proportions are 1 to 2 egg whites to 2 cups sugar, depending upon the texture desired. One-fourth the sugar may be added in the form of corn sirup or corn sugar, or acid may be used in the same proportion as in fondant. Honey also may be used, but since it contains so much levulose, it is necessary to use it in smaller amounts than corn sirup or corn sugar, approximately half as much or one-eighth of the total sugar.

Divinity is the best example of this group of candies. The basic proportions are these: 2 cups sugar, $\frac{1}{2}$ cup water, $\frac{1}{4}$ cup corn sirup or $\frac{1}{8}$ teaspoon cream of tartar, and $\frac{1}{8}$ teaspoon salt. Cook until a boiling point of 252° F. (hard ball) is reached. Pour the hot sirup slowly into the well-beaten whites of 2 eggs, continuing to beat until the mixture will hold its shape. Add 1 cup chopped nuts and $\frac{1}{2}$ cup chopped candied fruit. Drop from a spoon onto waxed paper or pour into an oiled pan as you would fudge and cut into squares.

Divinity can be varied like fudge by the use of chocolate or the substitution of other sugars and sirups for a portion of the sucrose. Divinity is a cream candy of a special texture; so this substitution must not go too far, or the candy will not cream.

Marshmallows are so readily available on the market that there is little reason to make them at home. They can be prepared by using the basic fondant proportions with more acid or with $\frac{1}{2}$ cup of corn sirup added. The sirup in this case is not to cream. It is cooked to the hard-ball stage and poured over 2 tablespoons granulated gelatin which has been softened in $\frac{1}{4}$ cup water. This mixture is beaten as it begins to cool and then is poured into a square pan, well dusted with confectioner's sugar. The beating in this case is to add air and not to cream the sirup. The incorporated air makes the mixture opaque.

Gelatin or gum arabic added to candies gives them a gummy or stiff jelly texture. These candies may be clear but are opaque if air is beaten in. The concentration of the sirup depends both on the final consistency desired and on the amount of liquid used in softening the gelatin or gum arabic. **Gumdrops** and **Turkish paste** are the best illustrations of this group of candies. They are given their special texture by the use of vegetable gums or pectin products. These are softened and dissolved in the hot flavored sirup. Most of these candies are clear; the consistency comes from the gum. The sirup has about the thickness of honey. Turkish paste usually is prepared with honey as the sugar and with the addition of nuts and various seed flavors.

Fruit pectin gives a jelly-like consistency to candy made from tart fruit pulp and sugar, cooked to a stiff jelly stage (224° to 226° F.). Fresh fruits may be cooked in their own juices until soft, or pie grade or pulped canned fruits may be used. The fruits should be rubbed through a strainer. Fruits lacking in acid should have 2 tablespoons lemon juice added to each cup of pulp and those lacking in pectin should have it added. Corn sirup, corn sugar, or honey may be substituted for a part of the cane sugar in the preparation of these candies.

The general proportions for jellied fruit candies[1] are 2 cups fruit pulp or juice, 2 cups sugar and ½ cup corn sirup, ½ ounce powdered pectin, and lemon juice to taste. Mix the dry pectin with half the cane sugar. Heat to boiling 1¼ cups of water and slowly sprinkle in the pectin-sugar mixture, stirring rapidly to get the pectin in solution. Add the fruit pulp or juice, corn sirup, remaining sugar, and the acid; heat to boiling point of 224° F. Pour into prepared molds or into pan dusted with powdered sugar. When set, remove from molds or cut in squares and dust with sugar.

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Pouring Pectin Candy into Mold · Fondant and gum or jelly mixtures may be poured into starch molds to form centers for covering with chocolate or sugar crystals

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[1] These are adapted from Cruess, "Jellied Fruit Candies," *The Fruit Products Journal*, pp. 25–126 (February, 1946).

III · Fruits and Their Preparation

Fruits are important sources of natural sugars in the diet. Since fruit serves as a vehicle for the distribution of the seed of the plant, it is not strange to find that in this group of foods aesthetic qualities prevail. They have not only desirable sweetness, but in addition pleasing odors and flavors. They would tempt the appetite even if they had little food value, but fruits are by no means just food accessories, important as this function may be. They also contribute important nutrients to the diet. Fruits are used fresh, frozen, canned, and dried. By far the largest amount is consumed fresh.

There are many kinds and varieties of fruit but no attempt will be made here to classify fruits horticulturally. From the point of view of their nutritive value, fruits are placed in two groups: those which are rich sources of vitamin C, such as citrus fruits and berries; and the other fruits which are less rich in this nutrient and are grouped with "other fruits and vegetables."

Another grouping of fresh fruits useful to dietitians is on the basis of their use as food fruits or flavor fruits. The food fruits are those which contain more than 20 per cent solids and so are comparatively high in calorie content. This group includes avocados, bananas, figs, dates, certain varieties of grapes, and olives. The fruits valued principally for their pleasant flavor and mineral and vitamin content have less than 20 per cent solids. This group includes apples, apricots, peaches, pears, plums, cherries, cranberries, currants, berries, all the citrus fruits, pineapples, and melons.

COMPOSITION AND NUTRITIVE VALUE

Different kinds of fresh fruit vary considerably in composition. Even different lots of the same kind of fruit may show considerable differences in composition, depending on variety, cultural condition, and degree of maturity. Table XI indicates the nutrients most important in the more common fruits. The water content of the edible portions of flavor fruits varies from 85 per cent in blackberries to 93 per cent in melons.

Most fruits are not important sources of proteins or fat. Two exceptions are the avocado (alligator pear) and the ripe olive. The percentage of fat in both these fruits is sufficient to make them useful sources of energy.

The carbohydrate in ripe fruit is present largely in the form of sugars—sucrose, dextrose, and levulose. Sugars are an easily available form of energy and also make an important contribution to flavor.

Fruits are among the best food sources of minerals—calcium, phosphorus, and iron—and also contain the other elements found in natural foods.

In vitamin content, there is considerable variation among the different kinds of fruit and even among varieties of the same kind. All fresh fruits contain some vitamin C. Berries and citrus fruits are outstanding sources of this vitamin. The yellow-fleshed fruits are rich sources of vitamin A. Fruits are only fair sources of the B vitamins. When used raw no vitamins are lost.

Table XI · *Comparative Nutritive Value of Different Fruits*[1]

	PER 100 GRAMS OF RAW FOOD, EDIBLE PORTION							
	Approximate Measure Equivalent to 100 Grams of Food	Vitamin-A Value	Vitamin C	B Vitamins		Calcium	Iron	Calories
				Thiamine	Riboflavin			
Apples	1 small		*					65
Apricots	3	***[2]						55
Avocados	$\frac{1}{2}$, 4″ diameter		*					265
Bananas	1 medium		*					100
Blackberries (or dewberries)	$\frac{3}{4}$ cup		**					60
Blueberries (or huckleberries)	$\frac{3}{4}$ cup		*					70
Cantaloupes (or muskmelons)	$\frac{1}{4}$ melon, 5″ diameter, or $\frac{1}{2}$ cup balls, $\frac{5}{8}$″ diameter	**	**					25
Cherries	$\frac{3}{4}$ cup		*					70
Cranberries	1 cup		*					55
Currants (fresh)	$\frac{3}{4}$ cup		**					60
Dates	12–15						*	315
Figs (fresh)	2–3 large							90
Gooseberries	$\frac{3}{4}$ cup		**					45
Grapefruit	$\frac{1}{2}$ medium		***					45
Grapes	1 bunch of 20–25 grapes							75
Guavas	$\frac{1}{2}$ cup or 1 large		***				*	80
Lemons	$\frac{1}{2}$ cup juice		***					45
Limes	$\frac{1}{2}$ cup juice		**					55
Mangoes	$\frac{1}{2}$ cup or 1 medium	**	**					75
Oranges	1 medium		***					50
Papayas	1 wedge 3″	**	***					45
Peaches	1 medium	*	*					50
Pears	1 medium							70
Persimmons (Japanese)	1 medium	**	***					85
Pineapple	1 slice $\frac{3}{4}$″ thick or $\frac{3}{4}$ cup		**					60
Plums	2–3 medium			*				55
Raspberries	$\frac{3}{4}$ cup		**					75
Rhubarb	1 cup diced		*					20
Strawberries	$\frac{3}{4}$ cup		***					40
Tangerines	2 small		**					50
Watermelons	1 slice, $2\frac{1}{2}$″ × $2\frac{1}{2}$″ × 1″, or $\frac{1}{2}$ cup balls or cubes	*						30

CHANGES DURING RIPENING

During natural ripening, fruit increases in size, the tissues soften, the color changes, the carbohydrates change in kind and amount, the flavor changes from acid, bitter, or astringent to mild, sweet, or bland, and the typical aroma develops. When ripening continues too long, fruit loses both food value and flavor. The composition of any fruit will vary with the stage of maturity at which it is picked.

Since ripening changes are brought about by enzymes in the fruit, they continue after the fruit is gathered. These changes improve the texture, taste, and appearance of the fruit; but ripening after picking does not influence markedly its proximate composition. Overripe fruit may show a loss in total carbohydrate. Most fruits are highest in quality if allowed to ripen before picking. Bananas and pears are exceptions to this rule.

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[1] Compiled by Bureau of Human Nutrition and Home Economics, United States Department of Agriculture.

[2] ***Excellent, **Good, *Fair. Less than fair (or no data available), no entry.

At times there are advantages in picking fruit in an underripe condition. Underripe fruit stands handling better than fully ripened fruit. Also the season may be extended by stimulating or retarding the ripening of picked fruits. Fruit picked underripe and ripened artificially is available earlier. Late fruit may be held under conditions which will retard ripening so as to be available when supplies are scarce.

Starch Changes to Sugar. The carbohydrates undergo important changes during ripening. Special enzymes change any starch present to the more flavorful sugars. The best example of this is the change in the banana during ripening. (See Table XII.) Bananas are fairly high in carbohydrate content. In the green banana the carbohydrate is largely in the form of starch. As the banana ripens this starch changes to sugar. The quality of bananas seems best when the fruit is picked green and ripened under controlled conditions. Bananas should always be held at temperatures above 58° F. They are ripened for the market at a temperature between 70° and 75° F. When they must be held after ripening, the temperature is reduced to 60°–65° F. to prevent undue drying out. Similar carbohydrate changes take place in other starch-containing fruits.

Other Changes. In most fruits the changes in texture are important. These also are brought about by the action of enzymes present in the fruit. These changes in texture also may be retarded by cool storage and stimulated by placing the fruit in a warm place.

Knell from U.S.D.A.

Firm but Ripe · Peaches are among the fruits that are highest in quality when tree-ripened. To reach the market in best condition, they must be picked at just the right stage

There is an apparent decrease in acid during the ripening of fruits. In some cases, however, the acid content is actually increased, but this fact is hidden by the increased sugar content. In other fruits the acid becomes more dilute since the pulp takes up water from the peel as the fruit ripens.

There are present in most fruits small amounts of complex carbohydrates to which the general term *pectins* has been applied. These are the substances responsible for the formation of jellies from acid fruit juices

Table XII · ***Composition of Banana Pulp at Different Stages of Ripening***	Stage	Per Cent Whole Fruit	Water	Solids	Reducing Sugar Invert	Sucrose	Total Sugar	Starch
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
	Green	58.95	72.29	27.71	.53	.41	.94	22.26
	Ripe	62.12	72.16	27.84	11.54	5.39	16.93	6.34
	Very ripe	68.14	75.50	24.50	12.59	5.98	18.57	.82

cooked with sugar. Since the amount of pectin decreases as the fruit ripens, overripe fruit may not have sufficient pectin to make a satisfactory jelly.

The proteins, fats, and ash in fruits undergo little change during the ripening process.

The flavor of the fruit is contributed by certain essential oils, other volatile compounds, and salts of organic acids, as well as the sugars. During ripening the essential oils and the volatile flavoring substances are developed. These are complicated chemical compounds that vary with the kind of fruit, and with the variety. They are unstable and break down if ripening continues too long.

In general, the vitamin content of fruits seems to increase as the fruit ripens. Naturally ripened fruits are slightly superior in vitamin content to those ripened after picking.

Artificial Ripening. In commercial handling many fruits must be picked underripe. It is important that the fruit be brought to the right degree of ripeness at the proper time. Low temperatures retard ripening and high temperatures stimulate ripening. The humidity of the surrounding air during storage is an important factor affecting quality. By regulation of temperature and humidity, quality is maintained, and ripening changes are controlled.

Exposure to ethylene gas has been found to hasten ripening changes in certain fruits and vegetables. Ethylene gas is especially effective in speeding up color changes in the skins of citrus fruits and tomatoes so that it is most frequently used with these fruits. In both cases the color is an important indication of ripeness to the consumer. Early in the season, green oranges may be ripe as measured by the sugar-acid content, but would be discriminated against by consumers because of the green color. Exposure to ethylene gas hastens the appearance of ripe coloring of fruits by destroying the green chlorophyll. This allows the other colors, orange, yellow, or red, to show when they are present. During ethylene ripening, starch may be changed to sugar and the sweetness of some fruits is increased. There is no increase of total carbohydrate. In some fruits, such as persimmons, the tannins seem to be oxidized and the flavor of the fruit is generally improved by this treatment. These changes occur even in extremely dilute concentrations of the gas.

Studies show only normal changes in composition and nutritive value when fruit is ripened by this method. Tomatoes ripened on the vine are better sources of vitamins than those picked when immature. There are no indications that ethylene gas has any destructive effect upon any vitamins developed before the fruit is picked. The commercial method of ripening tomatoes in ethylene gas produces fruits as high in nutritive value as tomatoes picked green and ripened at home in the sun. Ethylene ripening is a quick method, inexpensive, and easy to use.

Spoilage. After fruit is fully matured, ripening changes are retarded, continue slowly, and the quality deteriorates. The sugars are broken down as a result of the continuing action of the enzymes present, with a loss of both food value and flavor.

Under abnormal conditions spoilage may take place before fruit is ripe. If the fruit has not been properly sprayed, it may be infected with eggs from insects which develop as worms in the fruit. If the tissues of the fruit are injured by bruising, they break down, and release enzymes that cause abnormal changes. In either case, the normal processes of ripening do not take place, undesirable changes occur, and the fruit spoils. These decay changes are brought about by enzymes. But in these cases the fruit enzymes are supplemented by those produced and secreted in the fruit by organisms growing there—worms, bacteria, yeasts, and molds.

DIGESTIBILITY AND PLACE IN DIET

Fully ripened fruit is palatable and easily digested when eaten raw. The digestibility of unripe fruit and of fruits containing large amounts of cellulose and starch is improved by cooking.

When fruits are components of an ordinary mixed diet, they show a high percentage of utilization. In diets composed largely of fruit or of fruits and other vegetable foods, the nutrients are less well absorbed.

Fruits are valuable for their appetizing quality. They are important sources of minerals and vitamins in the diet. Few fruits can be recommended as inexpensive or good sources of either energy or protein.

Flavor and aroma are important in the diet. Appetizing odors and flavors stimulate the consumption of food and at the same time start the flow of the digestive juices required for digestion. Fruits are valuable appetizers and may be used fittingly at either the beginning or the end of a meal.

Fruits are among the best sources of minerals in the diet. Not only are fruits useful for the amounts and kinds of minerals present, but also for the forms in which these nutrients appear. The basic elements, especially potassium, are present in fruit in combination with organic acids, usually malic or citric. The organic acids present in fruit with the exception of oxalic and benzoic acid are readily oxidized or burned in the body, releasing the potassium, sodium, or calcium with which they are combined. These elements are important in maintaining the normal alkalinity of the body fluids. It seems strange that acid-tasting fruits yield an alkaline residue in the body, but the compounds which give the acid flavor to the fruits are acid salts of organic acids. The organic portion of these compounds burns, leaving behind free basic elements.

Some fruits contain small amounts of oxalic and benzoic acids, forms not burned in the body. In these cases the acid residues can combine with additional basic elements in the body and in so doing tend to take from the body fluids more basic elements than originally were present in the fruit. Cranberries and prunes contain such acids and may be acid-forming rather than base-forming.

The vitamins in fruits are especially important. All fruits contain some vitamin C, some much more than others. This vitamin is unstable to heat, so that any fruit makes its maximum contribution to the diet when used raw. The yellow fruits are good sources of vitamin A. None of the fruits are important as sources of the B vitamins.

Fruits in the diet are an aid to normal elimination. They provide bulk in the form of cellulose which is nonirritating and tends to hold water, and are especially useful in preventing constipation. At the same time, the mineral acids present in fruits may have a direct laxative effect.

SELECTION AND BUYING

It is usual to find many kinds of fresh fruits on the market at all seasons of the year. Local supplies are available in season. Modern methods of production, storage, and transportation have extended the season for all fruits, and made it possible to ship even the more perishable varieties to distant markets. Citrus fruits, avocados, different varieties of grapes, apples, melons, pears, pineapples, and even strawberries are now available almost every month of the year. The short-season fruits are available at times of the year when the less perishable fruits are in low supply. With such a variety from which to select, the consumer must decide what kind to buy, and how to choose the kind he wants.

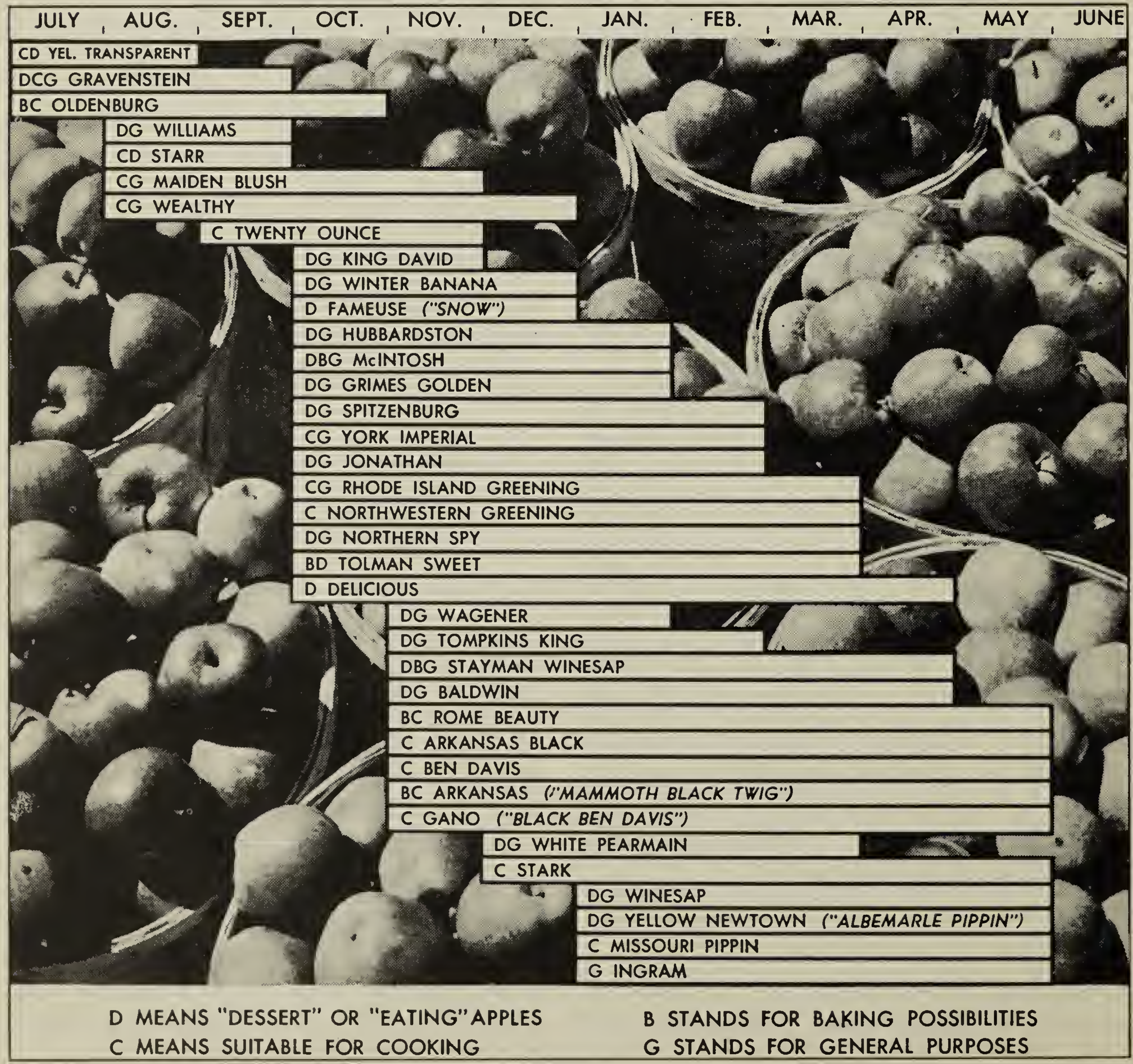
The kind should be selected with the family's needs in mind. (See page 20.) Within groups, choice is determined by the use to which the fruit is to be put, the variety and size best for that use, the quality, and the price.

Variety. With some fruits variety is important for flavor; with others it is important in the selection of the best for a particular purpose. For example, several thousand varieties of apples are grown in the United States. In most localities several varieties are available. These will vary in the uses to which they are best adapted as well as in flavor and cost. The consumer should know the uses for which the varieties available in her market are best adapted.

Some consumers find it economical to have two varieties on hand, one for eating and salads, the other for cooking. Those best

Around the Consumers' Apple Year · The chart below indicates the months during which the varieties mentioned are most plentiful and indicates the use for which they are most satisfactory

Harold M. Lambert Studios and U.S.D.A.



to use raw, or "dessert apples," as they are called, are usually more expensive. The chart (p. 50) will help in the selection of apples for various uses, and indicates the months when they come to market.

There are few varieties of pears as compared with apples, but these may vary considerably in quality unless properly handled. Bartlett pears are superior in dessert quality, but their season is short (August to September). Kieffer pears should be stored for about two weeks at a temperature of 60° to 65° F. to develop their best quality. Late varieties of pears, among which are the Bosc and the Anjou, are stored and come to the market from October to May.

Oranges come to the market from Florida and California. Texas ships some oranges, but the volume is small compared with that of the two important orange-producing states. These supplement each other well as to season. The Floridas are most abundant from November to April, while the Californias reach their peak after Christmas and continue available throughout the summer. California oranges are better for slicing or for use as a dessert fruit, while Floridas are preferred for juice. There are differences among the varieties from both areas. Since the different varieties ripen at different seasons, the best buy is the one in season. Oranges, grapefruit, and lemons come to peak production at different seasons, so that at least one of the popular citrus fruits is in good supply every month of the year.

Size. Most fruit growers now pack their products according to size. The citrus fruits are given size designations based on the number in a standard-sized crate.

Orange sizes run from 80 to 324 to a crate, and are known as "80's," "200's," "288's," etc. A "176," "200," or "216" would be considered a medium-sized orange, and is large enough to make a serving sliced or cut in halves. In retail markets juice oranges are now usually sold by the pound. It takes approximately a pound of oranges to give one cup (½ pint) of unstrained juice.

Osborne from U.S.D.A.

Orange Packing · Oranges are checked carefully for any blemishes and sorted for size before packing

Grapefruits range from 28 to 126 to the crate, the 64's being considered medium size. Lemons range from 240 to 490 to the crate. Both are sold in most markets by the pound.

Grades.[1] Quality standards are indicated by *U.S. Grades.* In establishing these grades the points considered are these: degree of ripeness; uniformity of size and shape; color; and freedom from injuries caused by mold, decay, freezing, cuts, bruises, worms, in-

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[1] *Standardization and Inspection of Fresh Fruits and Vegetables,* Miscellaneous Publication No. 604, United States Department of Agriculture.

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Knell from U.S.D.A.

Grading Apples · These apples go to market in containers carrying United States grades

sects, and diseases. The following United States grades are in use for fresh fruits:

U. S. Fancy: the highest grade, used for only the choicest fruits
U. S. No. 1: the second grade
U. S. No. 2: the third grade

While the use of these grades is optional, fruits in wholesale markets are generally sold on the basis of these standard grades. They occasionally are used in describing the products offered consumers in retail markets.

The lower grades are less expensive and are satisfactory for many uses if the waste in preparation does not offset the difference in price. Grades, when available, are a safeguard to the consumer.

Price. Price is no indication of quality or nutritive value but is determined by the balance between supply and demand. Fruit in season is the best in quality and usually the best buy. The available supply of shipped-in fruit is an important factor in determining price. Information as to the prevailing prices can be found in the daily newspapers and is broadcast by some radio stations along with suggestions as to the best buys for the day or the week.

CARE AND STORAGE

By proper control of temperature, moisture, and conditions of respiration, it is possible to increase considerably the length of time fruits can be held in storage. Refrigeration makes this possible commercially on a large scale.

The home vegetable or fruit cellar, if properly ventilated, may furnish satisfactory conditions for quantity storage of apples and pears for household use. When fruit is held in quantity it should be carefully watched and any showing signs of spoilage removed. In some communities it is now possible to buy apples at fall prices and, for a nominal sum per container, have them held in storage until needed.

The household refrigerator serves to hold small amounts of fruit or to chill the daily supply to the temperature for serving. Fruit should not be refrigerated until ripened. Low temperatures retard enzyme action and help to hold fruit at the desirable state of ripeness. Bananas should never be refrigerated, except to chill a ripened banana just before serving. When ripened bananas are held in low-temperature storage, the skin turns brown when they are removed.

Thin-skinned fruits tend to lose moisture in the refrigerator. This can be prevented by the use of ventilated, covered containers. Some refrigerators contain special compartments for the storage of fresh fruits.

Berries are among the most perishable

fruits. They crush easily and so should have a minimum of handling. For this reason they should be stored in the small boxes in which they are purchased. These containers are well ventilated and so help to retard the growth of mold.

PREPARATION AND COOKERY

Fruits are most nutritious when served raw; and most fruits are more palatable raw than cooked. There is a flavor in fresh fruit never found in the cooked product. The compounds contributing flavor are volatile and unstable. They tend to volatilize and break down during cooking.

Raw Fruits. Fruits served raw should be ripe and chilled. They may be served as juice, or whole, halved, quartered, or sliced, with or without sugar, alone or mixed in a fruit cup. So served, fruit is a most acceptable first course for any meal or it may be used as a dessert. Fruit juices are the favorite form of breakfast fruit, probably because in most cases they are quickly prepared and consumed. A little salt brings out the flavor of fruit. Lemon juice is a desirable addition to bananas and certain melons, and adds vitamins as well as flavor.

Whole fruit passed in a bowl is a very satisfactory dessert, especially for a low-calorie meal, and frequently is served with an accompaniment of cheese. Sliced fruits for dessert are served alone, with sugar, with sugar and cream, as a shortcake, or with ice cream. These various methods of service furnish an opportunity to vary the caloric content of a meal.

Some fruits, such as peaches and bananas, darken when the cut surface is exposed to air. For this reason they should be sliced just before serving. In most fruits darkening can be prevented by wetting the cut surfaces with diluted lemon juice. Raw fruits are especially appropriate in salads.

Cooking of Fruit. Some underripe fruits or fruits with firm texture and carbohydrate in the form of starch require cooking to soften the cellulose structure and cook the starch. Heating, which inactivates the enzymes in fruit and at the same time destroys any microorganisms present, is important in the preservation of fresh fruit for later use.

Softening Cellulose. Cellulose is softened by moist heat. The presence of added sugar prevents softening and toughens and firms the cellulose structure. When a smooth sauce or tender pieces are desired, the fruit should be cooked to tenderness before the sugar is added. On the other hand, when the aim is to preserve the shape of the fruit, sugar is added at the beginning of the cooking. The amount of sugar should be just enough to sweeten and not enough to mask the distinctive fruit flavor.

Picking Over Blueberries · Berries must be handled carefully. Pick over and store in original container. Wash just before using

U.S.D.A.

Cooking Starch. Underripe apples and bananas and plantains or cooking bananas always contain some starch. Slow cooking changes this starch to sugar and improves the flavor as well as the ease with which starch-containing fruits are digested.

Preservation. Raw fruit is perishable, some kinds more so than others. Cooking destroys both the enzymes which produce the ripening changes and the microorganisms which cause other types of spoilage. It is therefore a useful means of preserving fruit when supplies on hand cannot be used before they become overripe.

Methods of Cooking. Fruits should be so prepared as to retain as much as possible of their volatile flavors. An apple baked in the skin tends to retain its flavor. The use of a covered utensil in cooking saves some of the volatile flavors. In all methods, use the minimum amount of water required to soften and prevent sticking and cook only until tender.

Baking is a desirable method for cooking fruits like apples and pears which have a heavy outside peel. The peel holds in the steam necessary to soften the cellulose and keeps in the volatile flavors. Other fruits may be baked in a tightly covered baking dish with no added water or only a minimum amount.

Stewing or cooking in added water is by far the most common method used in cooking fruit. A pressure sauce pan is useful for this purpose since it requires a minimum of water and reduces the cooking time. With this method of cooking the juice should always be used with the fruit in order to avoid any loss of soluble nutrients. Sugar is added at the beginning of the cooking period when it is desirable to retain the shape of the pieces of fruit. When a sauce is desired, the sugar is added after the fruit has been cooked.

A Versatile Fruit Dish · Fresh fruits whole, halved, quartered, or sliced are tempting as a first course, as dessert, or in between as a fruit salad

CANNED FRUIT

Canned fruit has been cooked and sealed in an airtight container to preserve it for later use.

Appearance and Palatability. The appearance and flavor of canned fruits are similar to those of stewed fruits. Flavor is dependent mainly upon selection of the proper variety for canning at the right stage of maturity, a judicious use of sugar, and the conservation of the juice. The temperature used in processing influences the flavor, brings about changes in texture, and may cause changes in color. Modern methods of canning produce canned fruits with a minimum of these changes.

Kinds Available. Many fruits commonly eaten fresh are now available canned. Certain kinds and varieties of these yield superior products and have come to be especially popular.

Peaches are the most popular of the canned fruits and lead all other fruits in the amount produced. Peaches are packed whole, sliced, or in halves.

Pineapples come next to peaches in quantity canned. Canned pineapple brings to consumers a popular tropical fruit ready to use. The major part of the domestic production of canned pineapple comes from Hawaii; Puerto Rico supplies some. It is canned in whole or broken slices, diced or "tidbits," "fingers," or lengthwise strips, crushed, or shredded, or as pineapple juice.

Apples are canned in New York, Pennsylvania, the Virginias, and the Pacific Northwest. They are canned peeled, halved, quartered, sliced, as applesauce, and as apple juice.

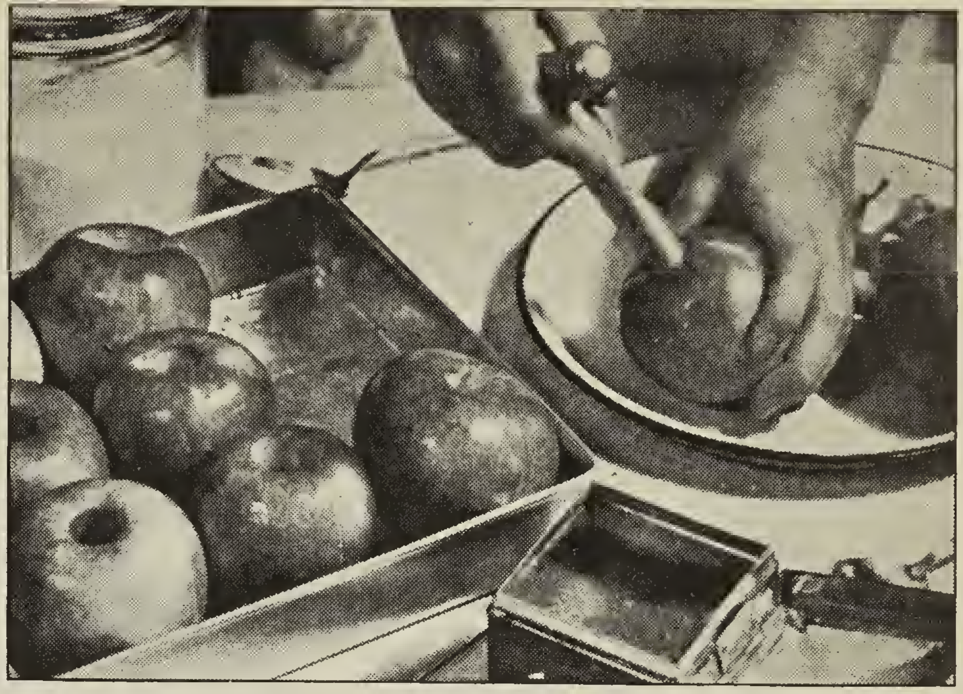
Practically all canned **apricots** come from California. There are three styles: Those with skins on that are halved and pitted are known as "apricots." "Peeled apricots" have the skins removed and may be halved and pitted. Some apricots are packed whole without removing the pits.

Berries of many kinds and varieties are canned in large quantities: blackberries, currants, gooseberries, black and red raspberries, loganberries, blueberries, and huckleberries. Berries need to be packed in a heavy sirup and in lacquered tin cans to hold their shape and preserve their flavor and color.

Several varieties of **cherries** are canned. These include the sour red cherries from New York and Michigan, and the yellow Royal Anne and the black cherries from the Pacific Coast and New York State. The sour red cherries are usually pitted, while the sweet varieties are usually canned with the stone in.

Grapefruit is canned in large quantities in Florida, Texas, and Puerto Rico, in the form of canned juice or sections.

Bartlett pears are canned mainly on the Pacific Coast, in New York, and in Michigan. Kieffer pears are canned in the eastern part of the United States. The quality of the latter variety is decidedly improved for canning if the pears are stored at a temperature of 60° to 65° F. for about two weeks before processing.


U.S.D.A.

Preparing Apples for Baking • Baking is a good cooking method for fruits with a peel to hold in juice and volatile flavors

Several varieties of **plums** are canned, including the Yellow Egg plum, the Green Gage, the Washington, the Davison, and the Italian Prune. Most plums are left whole with the stone in, although there are some canned plums which are halved and pitted.

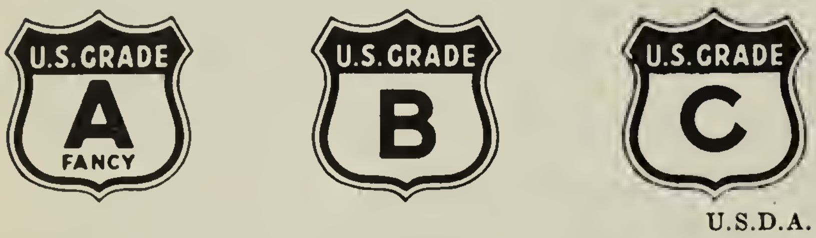
Orange juice is canned in large volumes, both alone and combined with grapefruit juice. Various forms of concentrated orange juice are on the market.

Fruit nectars are prepared from pulpy fruits. They are thicker than fruit juices since they contain some pulp and pectins. The ones most used are apricot and pear. Nectars are most desirable in mixed drinks.

Nutritive Value. The nutritive value of canned fruits is similar to that of a comparable weight of lightly cooked fruit. With modern canning methods most of the nutrients are retained.

Selection. Selecting canned fruit is like buying a pig in a poke. For this reason it is required that the label on the can carry certain information as to form, weight, and quality of contents. All must carry a statement of the net weight of the contents. To establish common understanding as to the meaning of the terms used in labeling canned fruits, the Food and Drug Administration has established definitions and standards of identity for the following canned fruits: peaches, apricots, pears, cherries, and fruit cocktail.[1] Under this definition the label must state, in addition to the net weight of the product, the variety of the fruit and its form; and must indicate the packing medium used (water, juice, light, medium, or heavy sirup), and any added seasoning allowed under the definition. Both sugar and corn sirups may be used, within certain restrictions set up to yield a product of expected sweetness.

U.S. grade[2] designations based on quality have been established. These are given letter designations. The letter grades with the designations used by the trade for comparable qualities are: Grade A (Fancy), Grade B (Extra Standard or Choice), Grade C (Standard), and Grade D (Substandard). Canned fruits that carry the U. S. grade designations have been processed in factories subjected to continuous inspection by representatives of the Agricultural Marketing Service. Cans are withdrawn from the processing lines and examined to establish grades for the lot under process. The form of this grade designation is illustrated above. This is a permissive service, but when used it gives the consumer a feeling of security. Any producer of canned foods may use this grading service. Any additional information on the label should be pertinent. Information as to the variety of the fruit canned, the relative size, and the number of pieces is sometimes useful.



United States Grade Designations for Canned Foods

FROZEN FRUITS

Frozen fruits, now generally available, bring to the market out-of-season fruits in field-fresh condition. Since these are frozen near the source of supply, vine-ripe fruit with superior flavor can be used. This method of preservation, applied at the point of production, saves waste from spoilage. Shipping costs are decreased, as only edible portions of the fruit are shipped. These savings eventually should lower the cost of distribution in frozen form.

This method of handling perishable fruit has long been used by preservers to hold supplies of perishable fruits to be made up for later use in a variety of sugar-preserved products. Now frozen fruits are available in consumer-sized packages and larger packages for institutional use. Sugar or sirup may be added before freezing. To be at their best, frozen fruits should be used immediately upon defrosting.

Those most generally available frozen are the more perishable fruits—berries, peaches, and cherries. During the tin shortage resulting from war conditions, freezing extended to applesauce, citrus fruit for salads, rhubarb, and a much wider variety of pie and sauce fruits for the institutional trade.

Frozen fruits are ready to eat. They should be held frozen, and are best when thawed just long enough before using to serve well chilled, with a trace of icy crystals in their tissues. The small package requires six to eight hours to thaw in the food section of the refrigerator, and three hours at room temperature if left in the original carton.

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[1] Federal Security Agency, Food and Drug Administration, Service and Regulatory Announcements, Food, Drug and Cosmetic No. 2 (revision), Definitions and Standards for Food (December, 1948).

[2] *The ABC of Canned Fruit and Vegetable Labelling*, Miscellaneous Publication No. 460, United States Department of Agriculture, Washington, D.C.

The fresh market equivalents of 16-ounce packages are as follows:

Applesauce	2 lbs.
Apricots, with sugar	1 qt.
Blackberries, with sugar	1 qt.
Blueberries, with sugar	2–3 qt.
Boysenberries, with sugar	1 qt.
Cherries (pitted) with sugar	2½ lbs.
Loganberries, with sugar	1 qt.
Mixed fruits, with sugar	2 lbs.
Peaches, sliced, with sugar	1 qt.
Pineapple, with sugar	2 lbs.
Raspberries, with sugar	1 qt.
Strawberries, with sugar	1 qt.
Youngberries, with sugar	1 qt.

DRIED FRUITS

Dried fruits are prepared by evaporating the water from fresh fruits. The purpose of drying is preservation, but the resulting decrease in bulk also means saving in transportation and in storage cost. Drying provides a form of fruit available at all times of the year.

Methods of Drying. The fruit may be dried in the sun or dehydrated in specially constructed evaporators. These evaporators are artificially heated and the rate of movement of air over the fruit to be dried is increased by mechanical devices so that the time required for drying is much shorter and better controlled than in sun drying.

The drying time also is influenced by the amount of surface exposed. To facilitate the drying, large fruits such as apples are sliced or cut in eighths, and apricots, peaches, and pears are halved.

Before drying, fruits are frequently treated with sulfur dioxide in liquid or gaseous form, to prevent discoloration and to soften the skins if these are retained. The amount of sulfur that can be left in the finished product is prescribed by food regulations, and dried fruits are carefully inspected to see that the sulfur dioxide content is not excessive. If only a small amount is left in, it is volatilized during the cooking of the fruit.

Composition and Nutritive Value. The composition of the several fruits most frequently dried is given in Table XIII.

During drying, over 50 per cent of the water is removed, but practically all the other nutrients important in the fruit remain, with the exception of vitamin C and, in some cases, vitamin A. The sulfurous acid formed during bleaching retards oxidation and thus decreases the destruction of vitamin C. During drying, the crude fiber is reduced in amount or softened; the starch is changed to sugar; the complex sugars are changed to

TABLE XIII · *Composition of Dried Fruits*

	COMPOSITION OF EDIBLE PORTION						
	Water	Protein	Fat	Total Carb.	Fiber	Ash	Fuel Value per Pound
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Calories*
Apples	28.1	1.6	2.2	66.1		.2	1,350
Apricots	29.4	4.7	1.0	62.5		2.4	1,290
Citron	19.0	1.5	1.5	78.1		.9	1,487
Currants	17.2	2.4	1.7	74.2		4.5	1,495
Dates	15.4	2.1	2.8	78.4		1.3	1,615
Figs	18.8	4.3	.3	74.2		2.4	1,475
Peaches	20.0	3.0	.6	73.5	3.7	2.87	1,413
Pears	16.5	2.8	5.4[3]	72.9		2.4	1,635
Prunes	22.3	2.1		73.3		2.3	1,400
Raisins	14.6	2.6	3.3	76.1		3.4	1,605

Dried Fruit Compote · A mixture of dried fruits makes a nutritious and attractive dessert

simple sugars; and the volatile oils and ethereal bodies which give the distinctive fresh flavor to the fruit are lost. Dried fruits are important sources of minerals. The energy value per pound of dried fruit (as purchased) is four to five times that of the same weight of fresh fruit. In cooking, water is added so that the prepared fruit should approximate the fresh fruit in composition. The chief difference is in vitamin content and flavor.

The stable form and comparatively low cost of dried fruits make them useful at times of the year when supplies of fresh fruit are limited and in markets where fresh fruits are not available. Their small bulk and good keeping qualities make them valuable forms of fruit in remote places and on long expeditions. They are useful for eating as they are, as additions to cereal dishes, breads, and cakes, or stewed in sauces.

Selection and Buying. Raisins, prunes, peaches, apples, and apricots are the dried fruits produced in the United States in largest quantity. Others which are available are currants, dates, and figs. While all these kinds can be produced here, special varieties of some of them are available only by import. About 95 per cent of the dried-fruit industry in the United States is concentrated in the Pacific Coast states.

Price is determined by the grade and the type of fruit and by the size of the package. Higher prices are justified for sanitary handling and packaging, but there is no justification for the fancy packages sometimes seen in the market.

Dried fruits are graded according to quality and size. Dried apples, apricots, peaches, and pears are designated as Extra Fancy, Fancy, Extra Choice, Choice, and Standard. The Extra Fancy is the largest, most uniform, cleanest, and therefore the best fruit. It is also the most expensive. Figs may be obtained as Fancy, Choice, and Standard. Prunes are graded according to the number in a pound and are known as "20–30's," "30–40's," and so on to "90–100's." Large prunes have a larger percentage of edible prune meat in a pound than small prunes. However, the price of the medium-to-small ones may be enough lower to make them the more economical buy.

Preparation and Cooking. The first step in the preparation of dried fruits is the cleaning. There are many opportunities for contamination unless the fruit is put up in sterilized packages. If dried fruit is to be eaten without cooking it should be sterilized by pouring boiling water over it. A strainer should be used for this purpose.

The aim in cooking dried fruit is to replace the water lost in drying. After being washed, prunes and peaches should be soaked for a short time in enough hot water to cover until they are plumped to almost their original size. Then they should be cooked slowly in the same water. As this water contains soluble nutrients from the fruit, it should not be discarded.

Dried fruits which are softer than peaches or prunes or specially treated dried fruits are cooked without previous soaking. The cooking water is always served with the fruit.

Sugar may or may not be added, according to individual taste and the needs of the particular fruit. When sugar is used, it should be added at the end of the cooking period so as not to toughen the peel or interfere with the absorption of water by the fruit.

Dried fruits have a variety of uses in meal preparation, from the uncooked fruits and simple sauces to pies, puddings, whips, frozen desserts, cakes, and candies. Their form adapts them to use in places where fresh fruits cannot be used. The sweet flavor of many dried fruits makes them acceptable substitutes for candy in the diets of children, with a great advantage from the standpoint of nutritive value.

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IV · Starch and Starch Cookery

Starch is the form of carbohydrate in which many plants store their reserve energy. When separated from the plant tissue, it appears as a fine white powder. The individual starch grains are so small that they cannot be seen with the unaided eye, but under the microscope the grains from the different sources have characteristic shapes.

In the presence of iodine, starch forms starch iodide, which has a purplish-blue color. This test can be used as a means of identifying starch or detecting its presence in plant tissues.

SOURCES OF STARCH

Starch is present in small amounts in the growing portions of most plants. The best sources of starch are the storage portions: the seed, roots, and tubers of food crops and the pith of certain tropical trees. The most abundant sources of starch in this country are the cereals corn, wheat, and rice. Both white and sweet potatoes are used in the manufacture of starch when these crops are in surplus. Most of the separated starch from any of these sources now goes into industrial uses.

In tropical areas, roots and tubers are an important source of the starch used in the diet: taro in Hawaii, cassava or manioc in Central and South America, and other roots in the tropical Pacific islands. These root starches have only limited use as a foodstuff in continental United States except as tapioca (see page 65). Arrowroot starch from the root of a tropical plant was at one time thought to be more easily digested than other starches and was specially recommended for use in invalid diets. It now has been replaced by the cheaper, more readily obtainable cereal starches that serve equally well.

Separation. Starch is obtained by grinding or grating the portions of the plant rich in this carbohydrate and separating the starch from the other materials present by fermentation and sedimentation in water. Since starch grains are heavy they tend to settle when released from the plant cells. The nonstarch portion can be poured off and the remaining starch grains washed with fresh supplies of water. Care must be taken in drying or the starch will be partially cooked during the process and the characteristic properties and appearance of the grains altered.

Separated starches carry the names of the plant sources. Most abundant in this country is cornstarch, the form in which starch is available on the consumer market. White flour made from soft wheat contains about 75 per cent starch. Since flour is available in most homes, it is commonly used as a source of starch in cookery.

Appearance. When starch grains are examined under the microscope, each kind shows a form characteristic of the plant from which it was obtained. Starch granules are built up in an orderly arrangement of two different forms of starch called amyloses. Starches from different sources are not uniform, but vary from each other in the relative amounts of these two amyloses which they contain.

All starches tend to show concentric markings running out from a central point called the hilum, or the point of origin. This seems to be the point at which the starch grain has commenced to grow and it is plausible to assume that the markings are in some way connected with the laying down of the two simple forms of starch in the grain.

The size and shape of the starch grains seem to depend also upon the compactness with which they have been packed in the storage cells of the plant. Potato and arrowroot starches have large grains shaped like oyster shells. In these the concentric markings show up well. The cereal starch grains are smaller, and in most cases angular, as if the sides had been flattened by pressure.

COMPOSITION AND NUTRITIVE VALUE

Separated starch, like sugar, is a pure carbohydrate, closely related in chemical form to the sugars. Just as the double sugars are built up in the plant from simple sugars, so the starches are built up from a number of molecules of dextrose ($C_6H_{12}O_6$) with the elimination of a molecule of water (H_2O) for each molecule of dextrose added. This is indicated by the formula $(C_6H_{10}O_5)x$. This basic unit is combined many times to make a grain of starch. When starch is boiled with acid, it takes up water and forms glucose, reversing the process of starch formation in the plant. (See page 28.) Weight for weight, starches and sugars yield the same amount of energy.

Cooked starches are easily digested. Raw starch is digested more slowly and may cause discomfort. Prehistoric man probably consumed most of his food raw; but civilized man has accustomed his digestive tract to cooked foods. Cooked starch now is preferred because of the greater ease of digestion and increased palatability of the cooked product.

STARCH COOKERY

The flavor of starch as well as its digestibility is improved by cooking. Some persons can detect the flavor of raw starch in foods. Starch may be cooked by either dry or moist heat.

Dry Heat. Dry heat changes starch to simpler compounds called dextrins. These have a sweetish taste and are soluble in water. In concentrated solutions dextrins form a gummy liquid known commercially as British gum. This is the sweetish adhesive used on postage stamps. Dextrins give a reddish-brown color with iodine in contrast to the blue color given by starch.

When bread is toasted, a portion of the starch is changed to dextrin, flavor is developed, and the texture is changed. By slow toasting a large proportion of the starch may be changed. Since dextrin is the first stage in the digestion of starch, well-toasted bread or zwieback is recommended for infants and persons who for any reason do not digest starch readily.

Other examples of the dextrinization of starch in ordinary cooking processes are the crust formed in baking breads and the tasty brown outside portions of starchy vegetables which are cooked at a high temperature, as in frying or baking. The starch in the ready-to-serve cereals is sometimes partly dextrinized in the manufacturing process.

Moist Heat. Starch grains are practically insoluble in cold water, although they are rendered slightly soluble if the grains are mechanically injured or broken by grinding. This breaks the tough outer layer and releases the more soluble portion. When stirred in cold water the starch grains tend to separate on standing.

On the other hand, when a mixture of starch and water is heated, the starch grains absorb water, swell, and form a viscous solution. This solution is more or less clear, depending upon the source of the starch and the relative amounts of the two amyloses present, and does not separate on standing. As the solution is cooled, the stiffness increases and gels of varying degrees of firmness are obtained.

This gelatinizing quality of starch is very useful in food preparation. Starch puddings which will hold their shape are prepared by cooking the correct amount of starch in liquid. Thick cream sauces used cold to bind chopped foods into croquettes are soft and palatable when served hot.

Since the swollen granules of cooked starch remain suspended in liquids and do not separate, starch is used in the preparation of cream soups to hold other material in suspension. Substances that do not go into solution but remain suspended in a liquid in finely divided particles are called "colloids" and form colloidal solutions in water. Starches form colloidal solutions when boiled in a liquid. This property of starch to thicken liquids and hold other materials in suspension is important in many cooked dishes.

The flavor of raw starch is destroyed by boiling. Although the digestibility of a starch mixture is not materially increased by boiling as compared with cooking at a lower temperature, the thickening of starch solutions reaches its maximum at about the boiling point. This thickening can be obtained in a double boiler, but a short cooking time (two minutes) directly over the heat at boiling temperature insures maximum thickening and avoids the danger of the so-called raw-starch taste, to which many object. The mixture then may be placed over hot water to continue cooking or to keep warm.

Thickening Power. It is important in starch cookery to know the amount of starch which should be added to the liquid to obtain the desired thickness. The same amounts of the different starches give slightly different results in consistency. Cereal starches as a group form firmer gels than root starches when both are used in the same proportions. There also are differences among the starches within these groups, in both the firmness and the elasticity of the gels formed.

The addition of sugar up to 50 per cent of the amount of starch makes a more tender gel but has little influence on the firmness of the gel formed. More than that amount of sugar produces a viscous gel.

Acid decreases the thickening power of starch solutions if the two are cooked together. When starch is boiled in the presence of an acid some of the starch is hydrolized to dextrin, which has no thickening power. In this case more satisfactory results are obtained if the starch and liquid mixture are cooked before the acid is added.

Preventing Lumps. When dry starch is added directly to hot water or milk, the grains on the outside cook first, inclosing raw starch grains in the interior and forming lumps difficult to combine smoothly. These lumps may be prevented by adding some other ingredient to the starch to separate the individual grains before combining it with the hot liquid. Sugar, fat, or cold liquid may be used for this purpose. These separate the starch grains and allow them to gelatinize separately, and so prevent the formation of lumps. Lumps are unsightly and unpalatable. Not only should the starch be added carefully, but also the mixture should be stirred until the starch is cooked smoothly.

Forms to Use. Starches are found on the market for household use, both as foods and for laundry purposes. The differences in starches are more apparent in laundry use than in cooking. For laundry use, stiffness and flexibility are both important and sometimes are obtained by special pretreatment of the starch. In cookery the thickening value is of chief importance. For thickening sauces, gravies, and soups, flour, almost always present in the household, may be used as the source of starch. For puddings and for thickening fruit juices a specially packaged starch may give a better product. This is usually cornstarch.

TYPICAL STARCH DISHES

A starch pudding is the simplest place to begin in working out starch proportions. In a pudding the proportion of starch to liquid should be such that the cooked gel has a consistency which will mold or hold its shape when cold. A good way to determine and fix in mind the comparative thickening powers of the different starches is to use them in making molds of pudding consistency. The starch most generally available is cornstarch. Potato starch can be prepared in class if supplies are not available on the market.

Approximately 2 tablespoons of cornstarch to a cup of liquid will give a pudding of suitable consistency for molding. If gels are made using the same proportion of all starches available, cooked in an identical manner, the resulting molds will demonstrate the comparative thickening value of the different starches used. Flour has about half the thickening value of cornstarch. Three to four tablespoons of flour to each cup of liquid will yield a gel that will mold.

When starches are cooked in milk, with the addition of sugar and flavoring, their thickening value or gel strength is shown, but the mixtures are opaque and the comparative clearness of the different gels is hidden. To show clearness as well as stiffness, these starches should be cooked in water without sugar or flavoring. When cooked in water, the root starches, in general, give clearer gels than the cereal starches. This is important only in thickening juices, as in fruit pudding and fruit pie fillings.

Puddings. In making a pudding the amount of starch can be varied according to the consistency desired. The standard proportions are 2 tablespoons starch (some prefer $1\frac{1}{2}$), 2 tablespoons sugar, and $\frac{1}{2}$ teaspoon vanilla or $\frac{1}{3}$–$\frac{1}{2}$ square of chocolate to each cup of milk. To prevent lumping, the starch grains should be separated by mixing with the sugar and with a small portion of the cold milk before adding to the hot milk. Starch puddings flavored with vanilla are called "white pudding" or "blanc mange."

Cocoa and chocolate contain starch and will affect the consistency of the pudding, making it thicker. Consequently the amount of starch may need to be reduced. When chocolate is used it should be melted in the hot milk before the starch is added; when cocoa is substituted for chocolate it should be combined with the starch and sugar.

The pudding mixture should be brought to a boil directly over the heat for two minutes to gelatinize the starch and destroy its raw flavor. Longer cooking, 5 to 10 minutes in a double boiler, improves the flavor of the pudding. It should be kept closely covered to prevent evaporation. Any flavoring extract should be added after the pudding has been cooked.

White Sauces. White sauces are cooked mixtures of flour and milk, which have the consistency of cream. On this account they are sometimes called cream sauces. Some form of fat is added for flavor and richness.

Proportions for White Sauces		Flour	Fat	Milk	Salt
		Tablespoons	*Tablespoons*	*Cup*	*Teaspoons*
	Thin white sauce	1	1	1	$\frac{1}{4}$
	Standard	2	2	1	$\frac{1}{4}$
	Medium thick	3	3	1	$\frac{1}{4}$
	Thick	4	4	1	$\frac{1}{4}$

The typical medium white sauce is made with 2 tablespoons flour and 2 tablespoons fat to each cup of milk. The amount of flour is increased or decreased if a thicker or a thinner sauce is desired. A sauce of the consistency necessary to bind materials, as in preparing croquettes, contains at least 3 tablespoons of flour to each cup of liquid, while a thin sauce contains 1 tablespoon of flour.

There are three methods of combining white sauces. In the first method, the milk and fat are heated in a double boiler, a small amount of the milk being reserved to separate the starch grains. This mixture of starch and cold milk is added, with constant stirring, to the hot milk. It is then placed over the fire for two minutes of boiling with constant stirring. In the second method, the starch and fat are rubbed together, added to the hot liquid, and the cooking is finished as above. In the third method, the fat is melted and the starch stirred into it, then the hot liquid is added, and the mixture stirred until it boils and thickens. The last method is used most frequently both because it is convenient and because heating the flour directly in the fat develops a desirable flavor in the sauce.

White sauces are served over vegetables, either alone or in combination with cheese. They are used for creaming meats, poultry, and fish. All scalloped dishes make use of them and they are used in binding croquettes. They are also a base for many other sauces.

Gravies are made in the same way as white or cream sauces, except that meat drippings furnish both fat and flavor and the liquid may be water, stock, or milk. Gravies range in thickness from a thin to a medium cream sauce, a thin consistency usually being preferred. The flour in gravy may be browned in the fat to develop flavor and color. Since browned or dextrinized flour has less thickening power than unbrowned, more flour will be needed to give a thickness to gravies made in this way.

Cream Soups. Cream soups are thin, white sauces flavored with vegetable juice or pulp, or broth from meat, poultry, or fish. The liquid base is a combination of milk and vegetable liquor or broth and vegetable pulp in any proportion to suit the taste. When vegetable pulp is used, the amount of starch or flour added should be decreased in accordance with the amount of starch in the vegetable.

The vegetables preferred for use in cream soups are potatoes, tomatoes, celery, cauliflower, spinach, corn, peas, beans, and lentils. The vegetable is cooked in a small amount of water until tender. This cooking water is combined with the pulp which has been rubbed through a strainer. Left-over vegetables may be used also. The amount of the vegetable material in relation to the milk depends upon the flavor and concentration of the vegetable liquor or purée. The usual proportion is half and half.

The proportions for a typical cream soup are 1 cup liquid, 1 tablespoon flour, and 1 tablespoon fat. This gives a soup of the consistency of thin cream. In case the vegetable liquor contains much thick, starchy pulp, the amount of flour should be decreased accordingly. The point is never reached where flour can be eliminated entirely, for the vegetable pulp is heavy and tends to settle. On the other hand, the starch in the flour forms a colloidal solution when boiled. This does not settle and holds in suspension the heavier vegetable material. This process is called "binding the soup."

The amount of fat may be varied in accordance with the flavor and food value desired. Table fats are most often used, but other fats such as bacon fat, drippings, and vegetable oils are satisfactory. Olive oil gives special flavor to bean and lentil soups.

In combining the ingredients for cream

soups, the methods suggested for combining white sauces may be used. The most convenient and therefore the most common method consists of melting the fat, stirring in the flour, adding the liquid (combination of milk and vegetable juice), and stirring until the mixture boils.

Cream soup may be prepared also by making a thin white sauce and grating the vegetables into it. This is especially desirable in the case of potatoes. The vitamin content of the potato is better preserved if the soup is just brought to a boil after the potato is added.

Cream of tomato soup requires special precautions because of the action of the acid in tomato juice on the milk. This will be discussed in the chapter on milk cookery.

Thin and flavorful soups are desirable for the first course in a dinner. For this purpose the proportions of flour and fat to liquid should be low and the soup especially well seasoned. It may even be desirable to substitute water for the milk, as is done in tomato bouillon. Onion juice, parsley, celery, salt, and herbs may be used for seasoning. Just enough well-flavored fat to give body and good flavor to the soup should be used in making the soup.

Thick, rich soup may serve as the main dish in a simple meal. The food value is increased by the amounts of fat, flour, and vegetable pulp used.

STARCH PRODUCTS

Certain tropical starches are distributed in other than powdered form.

Tapioca. Tapioca is prepared from the root of the South American plant cassava or manioc. In its preparation the root is ground and the starch is separated from the fiber. The starch is then allowed to settle, and is washed, collected, and dried on hot plates. This heating ruptures some of the starch grains, so that tapioca may be considered a partly cooked product. Tapioca is on the market in three forms: pearl, granulated, and powdered. Pearl tapioca is in the form of round balls which come in three sizes, large, medium, and small; the latter two are preferred because they require shorter cooking time than the large balls. The balls swell during cooking and become large and clear. When cooked carefully, the balls retain their distinct shape.

Granulated tapioca has been specially treated to reduce the cooking time. The starch masses are irregular in size and do not retain their shape during cooking to as great a degree as the pearl. Powdered tapioca is tapioca starch. It is useful in thickening when a clear mixture is desired.

Tapioca is used most frequently in the preparation of puddings. It is cooked in water or milk until it becomes clear. To avoid stirring, it should be cooked in a double boiler (after initial heating directly over the fire).

Tapioca fruit puddings are prepared by pouring the partly cooked tapioca over sliced fruit (stewed dried fruit may be used). Sugar and seasonings should be added and the combination baked until the fruit is tender. This allows time for the starch to complete cooking.

Tapioca custards are prepared by the addition of egg, sugar, and any desired flavorings to tapioca cooked in milk. This is usually called tapioca cream.

Tapioca may also be added to clear soups. It is added to the soup after the last straining and the mixture is cooked until the tapioca is clear. Used in this way tapioca adds body to these soups.

Sago. Sago, prepared from the pith of a tropical palm, is another starch food. The palm is cut down just before fruiting, when its trunk is filled with the starchy pith. This pith is taken out, grated to a powder, strained, and washed. It is then made into a paste and rubbed through sieves of various sizes, giving small- or large-sized sago. It is used in soups and puddings in ways similar to those suggested for tapioca. Sago is especially desirable when prepared in the same manner as a rice pudding.

Sago and tapioca are both inexpensive, easily digested foods. They contribute energy to the dishes prepared from them. Any other nutrients must come from the materials added to the tapioca and sago, fruits, milk, and egg. Both in soups and desserts sago and tapioca add interest and variety as well as contribute calories.

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V · Vegetables and Their Preparation

Vegetables are succulent portions of garden plants used as foods. This definition would include fruits, and indeed some vegetables are fruits. In common speech, fruits used in the main portion of the meal are designated as vegetables.

Since the different portions of the plant vary, vegetables are grouped on the basis of the portions of the plants used. Such a grouping brings together those which have comparable composition and are adapted to similar methods of preparation. Table XIV shows such a grouping.

COMPOSITION AND NUTRITIVE VALUE

In proximate composition vegetables are similar to fruits. Their total carbohydrate content is in much the same range, but vegetables as a group contain less sugars and more starch. This is particularly true of the tubers and root vegetables that have been adapted by the plant as storage portions, and of the seed, even in immature forms. The actively growing portions—shoots, leaves, flowers, and fruits—are high in water content. The vegetables in this group contain carbohydrate in the form of sugars, and they are rich in the minerals and vitamins required by functioning plant tissues. The green leaves that absorb the energy from the sun for use in building their own body tissue and as stored food supply are specially rich in these nutrients.

While a few vegetables, such as potatoes, both white and sweet, are important sources of energy in the diet, the more succulent vegetables, as a group, are primarily useful as sources of minerals and vitamins. They also add flavor and variety, and their cellulose

Table XIV · *Classification of Vegetables According to the Parts of Plants from Which They Come*

Roots	Tubers	Bulbs	Stems and Shoots	Leaves	Flowers and Fruits	Pods and Seeds
Beets Carrots Celeriac Dasheen Parsnips Radishes Rutabagas Salsify Sweet potatoes Turnips	Artichokes (Jerusalem) Potatoes (Irish)	Chives Garlic Leeks Onions	Asparagus Celery Fennel Kohlrabi Rhubarb	Brussels sprouts Cabbage Chard Chinese cabbage Collard Cress Dandelion Endive Kale Lettuce Mustard Parsley Spinach Watercress	Artichokes (globe) Broccoli Cauliflower Chayote Cucumber Eggplant Melons Okra Peppers Pumpkin Squash Tomatoes	Corn Cowpeas Green beans Peas Soybeans

content contributes bulk to the diet in a desirable form. The composition of the different vegetables varies with the kind and variety as well as the part used.

A comparison of the nutritive value of selected fresh vegetables is given in Table XV. The variations in composition are so wide that the special contribution of the different kinds can be discussed best by groups.

Roots, Tubers, and Bulbs. Plants not only store food for the purpose of reproduction, as in seeds, but many plants store food for their own use during unfavorable conditions. This stored supply may be used in the continuation of growth or in seed formation. The most common storage places for such temporary use are the roots, tubers, and occasionally bulbs; however, other portions of the plant such as thickened cabbage leaves may be modified for this purpose. Familiar storage roots are sweet potatoes, beets, carrots, parsnips, and turnips. While roots, tubers, and bulbs may be used fresh, these storage portions are more stable than the growing parts of the plant and under suitable conditions can be stored for varying periods of time.

The tuber most used is the white potato. This plant is bred to produce tubers of high cooking quality and nutritive value. Since the potato is propagated by planting the tuber, the plants normally are not allowed to form seed. The tubers are harvested when they reach maximum quality as a food and

Vegetables of Different Types · A variety of vegetables add interest to the diet and contribute to good nutrition

U.S.D.A.

TABLE XV · *Comparative Nutritive Value of Different Vegetables*[1]

	Per 100 Grams of Raw Food, Edible Portion							
	Approximate Measure Equivalent to 100 Grams of Food	Vitamin-A Value	Vitamin C	B Vitamins		Calcium	Iron	Calories
				Thiamine	Riboflavin			
Asparagus	6 stalks, 5″ long	*	**	*				25
Beans, lima, green	⅔ cup		**	*			*	130
Beans, snap, green	¾ cup, 1″ pieces	*	**				*	40
Beet greens	¼ pound	***[2]	**				**	35
Beets	2 beets, 2″ diameter or ⅔ c. cubes		*				*	45
Broccoli	¼ pound	***	***		*	*	*	35
Brussels sprouts	7 sprouts, 1½″ diameter		***				*	60
Cabbage	¼ pound		***					30
Carrots	2 carrots, 4″ long or 1 c. grated	***						45
Cauliflower	⅓ small head, 4½″ diameter		***				*	30
Celery	6 stalks, 7″ long		*					20
Chard (leaves and stalks)	¼ pound	***	**				**	25
Collards	¼ pound	***	***	*	*	**	*	50
Corn, sweet, all	1 ear, 8″ long or ½ cup		*	*				110
Cucumbers	14 slices, ⅛″ thick, 1½–2″ diameter		*					15
Dandelion greens	¼ pound	***	**	*		*	**	50
Eggplant	1 slice, ¾″ thick and 4″ diameter or 1 c. cubes							30
Endive	¼ pound	***	*				*	25
Kale	¼ pound	***	***		*	**	*	50
Lettuce, headed	⅓ of 10-ounce head 3″–4″ diameter	*	*					20
Lettuce, all other	10 large or 20 small leaves	**	*				*	20
Mustard greens	¼ pound	***	***		*	**	*	30
Okra	5–10 pods or ½ c. sliced	*	**			*		40
Onions, mature	2 medium		*					50
Parsley	1 bunch, 5″ diameter, approximately 100 sprigs	***	***			*	**	60
Parsnips	1 small		*					85
Peas, green	¾ cup	*	**	*			*	100
Peas, field or cowpeas (immature seeds)	¾ cup		*	*			*	135
Peppers	1 large	*	***					30
Potatoes, white	1 small		**					85
Pumpkin	½ c. diced	***	*					35
Radishes	10 red button		**				*	20
Rutabagas	¾ c. cubes		**					40
Spinach	¼ pound	***	***		*		**	25
Squash, summer	¾ cup		*					20
Squash, winter	½ cup	***	*					45
Sweet potatoes	⅔ medium	***	**					125
Tomatoes	1 small, 3″ diameter	*	**					25
Turnip greens	¼ pound	***	***		**	**	*	35
Turnips	¾ c. cubes		**					35
Watercress	1 bunch, 3″ long and 3″ diameter	***	***			*	*	25

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[1] Bureau of Human Nutrition and Home Economics.

[2] ***Excellent. **Good. *Fair. Less than fair, no entry.

before their stored energy is used for the further development of the plant and the formation of seed.

In the white potato, the energy is stored largely in the form of starch. The amount of protein is small, but of good quality as compared with other proteins of vegetable source. In food value the potato stands midway between cereals on the one hand and succulent roots and green vegetables on the other. In starch content and total calories, the cooked potato is comparable to the cooked cereals. In mineral and vitamin content potatoes are more like fresh vegetables. They assume special importance in some diets because of their alkaline ash.

When used in large amounts as they are by some families, potatoes properly prepared are important sources of vitamin C in the diet. One scientist calculated that in the amounts used in this country potatoes, if prepared to conserve vitamin C, could contribute one sixth of the national calculated requirement for this vitamin.

The sweet potato, weight for weight, yields more energy than the white potato. It contains more carbohydrate, both as sugar and as starch. Some varieties are rich sources of carotin and yield important amounts of vitamin A.

The other root vegetables (beets, carrots, parsnips, turnips, etc.) vary in composition. With the exception of tropical roots, little used in the United States, they contain less carbohydrate than either white or sweet potatoes, and the carbohydrate present is largely in the form of sugars. Nutritionally they are valuable chiefly for their mineral and vitamin content.

The bulbs commonly used as foods in this country are chiefly valuable for the flavors they contribute. They vary in composition with the stage of maturity. Their nutrient content is more like that of the succulent vegetables than the starchy roots and tubers. There is considerable variation in nutrients among the vegetables in this group.

Mead from U.S.D.A

Three Members of the Cabbage Family · (*Upper left*) Kohlrabi; (*Lower left*) Collards; (*Lower right*) Broccoli

U.S.D.A

Mead from U.S D A.

Stems. Stems might be called the waterways of the plant. Their chief function is carrying the soluble nutrients from one portion of the plant to another. They are rarely used by the plant as a storage place. Celery and rhubarb are not important as sources of energy, but are of value in the diet primarily as sources of minerals, vitamins, flavor, and cellulose. Celery leaves are useful in flavoring soups, stews, and stuffings. Rhubarb leaves should never be used because of the high content of oxalic acid. This acid is not burned in the body and in large amounts is harmful.

Leaves. The leaf is the manufacturing portion of the plant. Here photosynthesis takes place. (See page 10.) In order to absorb from the air the carbon dioxide necessary in the formation of carbohydrates and to catch the energy from the sun, surface is desirable. So in the leaves the plant cells containing the green chlorophyll are spread out on a network of cellulose. Since the carbohydrate formed is rapidly transported to other portions of the plant, the leaves are low in energy but are very valuable sources of minerals and vitamins. They are the best vegetable sources of riboflavin.

All leafy vegetables contain calcium. However, the calcium is utilized best from those leaves containing no oxalic acid, such as collards, turnip greens, mustard, and kale. Spinach and beet tops contain undesirable amounts of oxalic acid.

Leafy green vegetables, as a group, also are useful sources of iron, of vitamin A, and when eaten raw or lightly cooked, of vitamin C. The bleached or pale inner leaves of vegetables like cabbage and lettuce are less useful as sources of these nutrients than green leaves.

Fruits and Flowers. Tomatoes, eggplant, and squash are typical examples of fruits used as vegetables, while cauliflower, broccoli, and globe artichokes are flowers. These vegetables are not high in energy value, but they are important on account of their pleasing flavors and the minerals and vitamins they contain. Tomatoes rank close to citrus fruits as a source of vitamin C.

Pods and Seeds. Pods and seeds of leguminous plants form an important group of fresh vegetables. These seeds, even in immature form, are high in food nutrients. Green beans are used pod and all. Peas, except one special variety, and lima beans are shelled for use; cowpeas and black-eyed peas also may be used fresh in the same way, if collected while still immature and tender. Certain varieties of soybeans are very palatable when used in succulent form as a green vegetable. They may be either shelled for cooking or cooked in the pod. All this group is higher in protein than other fresh vegetables, the soybeans containing protein of good quality. They are also good sources of minerals and vitamins, especially the B vitamins.

SELECTION AND BUYING

Green or succulent vegetables are highest in quality and nutritive value immediately after they are gathered. The maturing of vegetables, like the ripening of fruits, is brought about by enzymes and their action continues after the vegetable is gathered. Vegetables dry out easily and wilt quickly after they have been picked. This is especially true of the tender ones with high water content, and without a protective peel or skin.

Both enzymatic changes and loss of water are most rapid in the leaves and growing portions. Leaves with their expanse of surface lose water rapidly. The high water content of the growing portions evaporates, causing them to wilt and lose their crispness. Fruits such as tomatoes, cucumbers, and squash, which are covered by skins, and roots with fibrous peel and low water content are less vulnerable to loss of water. But these too will shrivel if held under unfavorable conditions too long after gathering.

Changes in Quality. The enzymes present change the form of carbohydrates in vegetables held after gathering. The change from sugar to starch is especially noticeable in sweet corn and green peas. It takes place to a lesser degree in all succulent forms of vegetables, however, and is an important factor in loss of flavor. There is also some breaking down of the chemical substances that give characteristic flavor and color to vegetables, and a toughening of the fiber, especially noticeable in asparagus. These are all brought about, at least in part, by enzymatic changes.

More serious is the effect of enzymes on loss of vitamin content. The oxidative enzymes present in all plant tissues are specially destructive to vitamin C. A gradual loss of this vitamin occurs when vegetables are held after gathering. This loss increases rapidly when the cell contents are exposed by bruising or cutting. The pro-vitamin A, or carotin content, of the leafy vegetables is lowered as they wilt and the cells collapse. The B vitamins are more stable but there is some storage loss of these too.

All this adds up to the original statement. The succulent vegetables are highest in quality when first gathered. The development of rapid transportation and refrigeration, and of methods of controlling or retarding undesirable changes has made it possible to ship vegetables long distances with minimum changes in quality. Important factors in controlling these changes are low temperatures, moist air to prevent wilting, and avoidance of bruising.

The seed of fresh legumes lose quality after shelling. They should be purchased in

Iced Vegetables · Crushed ice provides the low temperature and moisture required to maintain quality fresh vegetables

National Association of Ice Industries

the pod unless wanted for immediate use. Since cold retards changes in pod vegetables, they should be held at low temperatures.

The roots, tubers, and bulbs are more stable than the other groups. Some changes take place after gathering, but these vegetables lose less in vitamin content than do the more succulent vegetables. Losses can be held to a minimum by suitable storage conditions. The carbohydrate content of all root vegetables changes form with the temperature of storage. (See page 74.)

Buying Guides. The above discussion suggests the things to look for in selecting vegetables. Quality comes first: fresh, firm, but tender vegetables, free from bruises or other imperfections, are best. Those of uniform sizes and regular shapes are most easily prepared and have the least waste. Head vegetables should be solid with few waste leaves, and leafy ones should not be wilted.

There are many **varieties** of the different vegetables. Some of these are better adapted to certain uses than others. Many varieties are especially adapted to growing conditions in certain sections of the country. It is well to know the varieties in the local market at different seasons, and the uses for which each serves best.

Standard grades for fresh vegetables have been set up by the U. S. Department of Agriculture. Among the points considered in establishing grades are these: degree of ripeness, uniformity of size and shape, color, and freedom from mold, decay, freezing, cuts, bruises, worms, insects, and any indications of plant disease. U. S. Fancy is the highest grade. This is applied only to the choicest products. U. S. No. 1 is the second grade, and U. S. No. 2 the third grade. These grades are not often used in retail displays.

Price measures not food value or quality but supply and demand. Vegetables are at their best and lowest in price when in season. Out-of-season vegetables are usually grown in distant places and are more expensive because of the cost of handling and transportation.

U.S.D.A.

Grades of Potatoes

Amounts to Buy. Adaptability of a vegetable to storage, available storage space, nutritional needs of the family, and the number of persons to be served should determine the quantity to buy. By judicious buying and storing, the housewife or dietitian can provide a variety of vegetables for each day, without buying too many kinds at one time.

HOME CARE AND STORAGE

The fresh and green vegetables should be given attention as soon as they come into the kitchen. They should be examined carefully and any bruised leaves or imperfect portions discarded. Then they should be thoroughly washed, to remove all sand or soil. If vegetables must be held for later use they should be kept at low temperatures, always above freezing.

Salad vegetables keep best if placed in a tightly covered salad pan with just the water which clings to them in washing. Many refrigerators come equipped with these containers or they can be purchased separately. Other green vegetables may be put into the

Forsythe from U.S.D.A.

Washing Leafy Vegetables · In washing lift leafy vegetables out of the water; any soil or sand settles to the bottom. Repeat until the last water shows no sand

refrigerator in the pan in which they are to be cooked, or in any covered container, a waterproof bag, or wax paper. Peas or lima beans should be left in the pods. They may be stored in the bags in which purchased.

French cooks parboil any vegetable which is not to be prepared immediately, to stop enzymatic changes, then reheat it later for serving. This pre-cooking is referred to as "blanching." It conserves the flavor and nutritive content of vegetables not to be cooked immediately. If done quickly, as in a pressure sauce pan with a minimum amount of water, blanching is not especially destructive to vitamin content.

Most of the root vegetables can be stored in a cool place without refrigeration. The regulation of both temperature and humidity is important when root vegetables and tubers are stored for long periods.

The temperature at which some root vegetables are stored is important. When potatoes are stored at temperatures below 50° F., so much of the starch present is changed to sugar that they are unsatisfactory for use in making potato chips and French fried potatoes. The cooking quality is best when they are stored between 50° and 60° F. For long periods of storage, temperatures between 38° and 50° F. are recommended to prevent sprouting. The change from starch to sugar caused by storage at such low temperatures can be reversed by storing the potatoes for a period of time at temperatures above 50° F. The flavor of parsnips is improved by storage at a low temperature, which stimulates the change of the starch to sugar.

PREPARATION AND COOKERY

Many fresh vegetables can and should be eaten raw, as relishes or in salads. Any vegetable which is low in starch and has a tender, crisp texture is palatable raw. Celery, carrots, and peppers are cut into strips; turnips, cucumbers, and onions into thin slices; and cauliflower is separated into flowerets for service as relishes. These may be crisped by short soaking in ice water, but prolonged soaking is undesirable because of the resultant loss of soluble nutrients from the cut cells.

Other vegetables are improved by cooking. This gelatinizes any starch, softens the cellulose, and improves both palatability and ease of digestion. The bulk of most vegetables is reduced by cooking. The added seasoning and forms of service give variety and increase the palatability of this important group of foods.

Palatability in cooked vegetable dishes is a combination of flavor, texture, and appearance. The preparation should maintain and develop these factors as far as is possible without undue loss of nutritive value.

Since vegetables constitute a valuable source of vitamins and minerals, it is especially important to regulate cooking methods so as to prevent undue losses of these important constituents. Methods of cooking that conserve flavor tend to prevent nutritive losses.

Flavor. Each vegetable has its characteristic flavor. As a general rule this should be conserved in the preparation. Some of the substances contributing flavor are soluble, others are volatile, and still others are decomposed if heated too long. Any method in which the cooking water is discarded results in a loss of both food value and flavor. Flavors are retained by baking vegetables in the skin or by cooking them in covered utensils. The good flavors resulting from paper-bag cookery were due partly to the retention of the volatile substances responsible for flavor. On the contrary, if a vegetable is too strong, some of the flavor may profitably be volatilized by cooking in an open kettle.

Some vegetables with a relatively mild flavor develop a strong flavor when cooked too long. This is particularly true of the members of the cabbage family. The flavor of finely chopped cabbage boiled for five minutes, or heated to serving temperature in milk or cream sauce, is very much milder than that of the same cabbage boiled for an hour. This makes one wonder whether some so-called "strong-flavored" vegetables are really strong-flavored or just made so by the method of cooking.

Browning the starch or caramelizing the sugar in vegetables during baking or frying develops flavor and may add interest to an otherwise uninteresting vegetable.

Texture. A firm though tender texture is desirable in vegetables low in starch. They should be cooked the shortest time necessary to obtain tenderness and should be cooked just before serving time. Holding vegetables after cooking changes the texture, color, and flavor, and decreases the vitamin content.

Starchy vegetables should be cooked long enough to gelatinize or swell the starch but require special precautions to avoid sogginess. A mealy texture is obtained by baking potatoes until the center reaches the boiling point so as to cook the starch. Then break them open to allow steam to escape. When peeled potatoes are boiled, the water should be drained off and the kettle placed over a low flame to drive off excess moisture; the kettle should be shaken to prevent sticking. For best flavor, potatoes should be cooked at boiling temperature not under pressure. The texture of boiled old potatoes may be improved by wringing lightly in a clean cloth immediately after cooking.

Color. The appearance of the cooked vegetables is partly a question of texture and partly a question of color. Conditions of cooking affect the various colored vegetables differently, since the pigments responsible for the different colors in vegetables vary in solubility and stability to heat.

The bright green color in vegetables is due to the presence of chlorophyll. This pigment is only slightly soluble in water but is easily destroyed by high temperature and long cooking, particularly in the presence of the acids formed in cooking vegetables. Soda is sometimes used in cooking green vegetables to neutralize this acid and prevent change in color. It also hastens the softening of the cellulose and decreases the cooking time. It must be used with care since too much increases the loss of vitamin C. Soda is not necessary when green vegetables are properly pre-

Cauliflower · Cooked vegetables should have a tender but firm texture

U.S.D.A.

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Baked Potatoes · After baking potatoes open them to allow the steam to escape

pared, and may injure both the flavor and the texture of the cooked product. The color and texture and the vitamins are conserved when vegetables are cooked in boiling, salted water in an open kettle until just tender. Using boiling water at the start decreases cooking time. Since the chlorophyll-destroying acids formed in cooking are volatile, they are carried off in the steam if the vessel is uncovered.

On the other hand, if the vessel is closed, these acids condense on the cover and drip back onto the cooking vegetable, causing the undesirable change in color. While a pressure sauce pan must be closed for cooking, the required cooking time is too short to affect the color. The pressure should be reduced as soon as green vegetables are cooked and the cover removed as quickly as possible to avoid condensation of the volatile acid and the resulting change in color.

The yellow or orange color in such vegetables as carrots, sweet potatoes, and winter squash is due to the carotinoids, carotin (orange yellow), and lycopin (orange red), which are insoluble in water. This orange color is quite stable with respect to heat and is not affected by the vegetable acids. Since the appearance of the yellow vegetables is not affected by ordinary methods of cooking, the conservation of flavor and nutritive value are the only problems in their preparation.

White cabbage, cauliflower, and white onions contain pigments called flavones, dissolved in the vegetable juices. As the vegetable cooks these escape into the cooking water and turn yellow in hard alkaline waters. This yellow color, which is not unattractive, should not be confused with the dark color caused by overcooking.

The red and purple coloring in red cabbage and beets is caused by a group of pigments known as anthocyans. These are very soluble in water and may go through a wide range of color changes, from red to blue to green, with small differences in acidity. When they are made alkaline, as by the addition of soda or by the use of hard water, they turn blue, then fade and turn gray. To prevent this, dilute acid, such as vinegar or lemon juice, is added. The amount of acid required to hold the red color when cooking these vegetables depends upon the alkalinity of the water in which the vegetable is cooked.

Nutritive Losses. Loss of nutrients in cooking vegetables is caused by their solution in the cooking water, and by chemical changes in the unstable nutrients, particularly the vitamins. Losses by solution are avoided if the cooking liquid is served with the vegetable or is used in making soups or sauces. Both the vitamin and mineral content of the diet may be seriously reduced if vegetable juices are repeatedly drained away. Since it is not always feasible to use excess cooking liquid, it is well to cook vegetables by methods that require the addition of minimum amounts of water.

Some food nutrients dissolve in water more readily than others. Sugars, vitamins, and minerals are specially soluble. The amounts dissolved in the cooking water increase with the amount of liquid used, the cut surface exposed, and the time of cooking.

The B vitamins and vitamin C are not

Table XVI · *Amounts of Vegetables for Serving and Time for Cooking*

VEGETABLE	MEASURE OF 1 POUND	SERVINGS PER POUND	PREPARATION FOR COOKING	TIME FOR COOKING (in Min.)		
				Baked	Steamed	Boiled
Artichokes (globe or French)	2	2	Whole			30
Artichokes (Jerusalem)		4	Pared, whole	30–60	35	30
Asparagus	16–20 stalks or		In bunches			15–20
	2 c. 1-inch pieces	4	1-inch pieces		12	10–12[1]
Beans (green)	⅔–¾ qt. or 3 c. (80 pods)	5	Split or in pieces			15–30
Beans (lima, fresh)	3 c. in pods	2–3, 4–6 (sh.)	Shelled			20–30
Beets (young)	2 bunches	3–4	Whole	60–75	45–60	30–45
Beets (mature)	3–4 beets	3–4	Whole		60–90	60–90
Beet greens	2 qt.	3	With stems			15–20
			No stems			10
Broccoli	2–4 medium heads	3–4	Split			15–20
Brussels sprouts	24 medium heads	4–5	Whole			10–12
Cabbage (Chinese)	1 large stalk or 2 small stalks	4–6	Cut			15–20
Cabbage (red)	½ small head	4	Quartered		15	10–15
			Shredded		10	5–10
Cabbage (white)	½ small head	3–4	Quartered		15	10–15
			Shredded		10	5–10
Carrots (young)	8	4–6	Whole		20–30	15–20
Carrots (mature)	4	4–6	Split lengthwise		25–30	20–25
Cauliflower	1 medium head	3–4	Separated		10–15	5–10
			Whole		20–25	15–20
Celery	1 medium stalk	4	Diced		20–25	10–12
Chayotes	2 medium	4	Sliced		20	15
Collards		2			30	20
Corn	2 ears	2	On cob		10	6–10
Cucumbers	2 large (about 6 in.)	5–6	Whole	30	20	10–15
			Sliced			5–6
Dandelion greens		3–4				10–20
Eggplant	1 medium	3–4	Diced		15	10
Endive (curly)	1 head	3–4				15–20
Fennel	2–3 medium	3	1½-inch pieces		25	15–20
Kale		3				20–25
Kohlrabi	4 medium	4	Peeled, sliced		30	25–30
Mushrooms	24 medium caps	4	Whole or sliced	15		5 (in own juice)
Mustard greens	2 qt.	4				15–20
Okra (pods)	24 med., 10 4-in. or 3 c.	4	Whole		20	10–20
Onions (small, green)	2 bunches or 24 small	6	Whole			10–20
Onions (large, mature)	4	4	Peeled, whole	1		30–40
			Peeled, cut in half			20–30
Parsnips	3–4 medium	4	Whole	30–45	30–40	20–30
Peas (green)	50 medium pods, 1 qt. in pods	2–3, in pods	Shelled			10–20
Potatoes (cobbler)	3 medium	3	Whole	45	40	30
			Sliced or diced			10
Potatoes (russet)	1 large or 2 small	3	Whole	60	50	30–35
			Sliced or diced			10
Potatoes (triumph, new)	4 medium	4	Whole		40	20–30
Rhubarb	8–10 stalks or ½ large bunch	3–4	1-inch pieces	15	5	5
Rutabagas	1–2	3	Pared, quartered			20–30
Salsify	8, or 1–2 bunches	4	Sliced		20	15
Soybeans (green)	50 medium pods or 1 qt.	2–3, in pods	Shelled, after boiling 3 min.[2]			2–3 min. (pods)
						20 min. (shelled)
Spinach	2 qt. not chopped	3–4	With stems			10
			No stems		5–6	5–8
Squash (summer)	1–2 medium	4	Pared, sliced		15–20	10–15
Squash (winter)		2–3	2-inch pieces	45–60	30–40	15–20
Sweet potatoes	3 medium	3–4	Whole	45	30–35	25–30
Swiss chard	2 qt.	3–4	With stems			20–30
			Leaves alone[3]			10
			Stems alone			30
Tomatoes	4 medium	4	Whole	30		10–15
			Sliced or quartered	10–15		5
Turnips	3–4, 1 bunch	3–4	Sliced or diced		20–25	10–15
Turnip greens		3				20–30

[1] Time can be shortened by cooking tips separately from tougher parts.

[2] Soybeans shell more easily after boiling 2–3 minutes.

[3] Cook separately and combine before serving.

only soluble but are unstable to heat. Vitamin C oxidizes readily, and its destruction is hastened by heating in the presence of oxygen from the air, the cooking water, or the vegetable tissue itself. The destruction is less rapid in acid foods such as tomatoes. Short cooking at the boiling point is less destructive of vitamins than long cooking at lower temperatures. Keeping food hot lowers its vitamin content.

Methods of Cooking. A variety of methods are used in cooking vegetables. These differ in the preliminary preparation of the vegetable, the way the heat is applied, the utensil required, and the cooking time.

Cooking time varies with the kind of vegetable, its preparation for cooking, and the way the heat is applied. When water is required the cooking time is decreased by the use of boiling water. In the preparation, discarding tough portions and cutting the vegetables into thin slices or small pieces also help to speed up the cooking. Cooked vegetables should be tender but not soft and should retain some of their original crispness. Table XVI gives approximate times for cooking typical vegetables. The different methods of cooking are discussed below.

Baking a vegetable in its skin retains practically all its mineral content, causes no loss by solution, and protects flavor. Such vegetables as potatoes, squash, cucumbers, and tomatoes lend themselves readily to baking. They contain enough water to form steam and keep them moist, and their skins hold in the steam as it forms. Other vegetables can be baked successfully in a covered casserole. The cover can be adjusted at the end of the cooking period to allow excess water to evaporate and flavor to develop from browning. A moderate oven (350° to 400° F.) which allows a gradual penetration of heat is best for baking most vegetables, either in the skin or in a casserole.

Steaming is the second-best method for cooking vegetables, from the viewpoint of retention of nutrients and flavor. The loss of soluble nutrients is less than in boiling, and the vegetable retains its original shape and color. Steaming is a good method for cooking carrots, squash, beets, parsnips, sweet potatoes, wax beans, and many other vegetables. The exceptions are vegetables containing green pigment; but some of these, spinach, for example, and other thin green leaves, may be prepared by steaming if too large quantities are not cooked at one time. Steamed vegetables may be salted either at the beginning of the cooking or just before they are served.

Steaming under pressure, as in the pressure sauce pan, shortens markedly the cooking time of vegetables. A minimum of added water is required. When the directions of the manufacturer are carefully followed, the cooked product is of good texture and flavor, and vitamin losses are kept to a minimum.

Boiling is the most common method of cooking vegetables. The food value of boiled vegetables can be conserved when the cooking process is managed properly. Vegetables such as cabbage, turnips, onions, cauliflower, brussels sprouts, and rutabagas should be boiled gently with only enough water to cover. Green vegetables should be cooked

Baked Beets · Beets retain much of their flavor and nutritive value when baked in a casserole

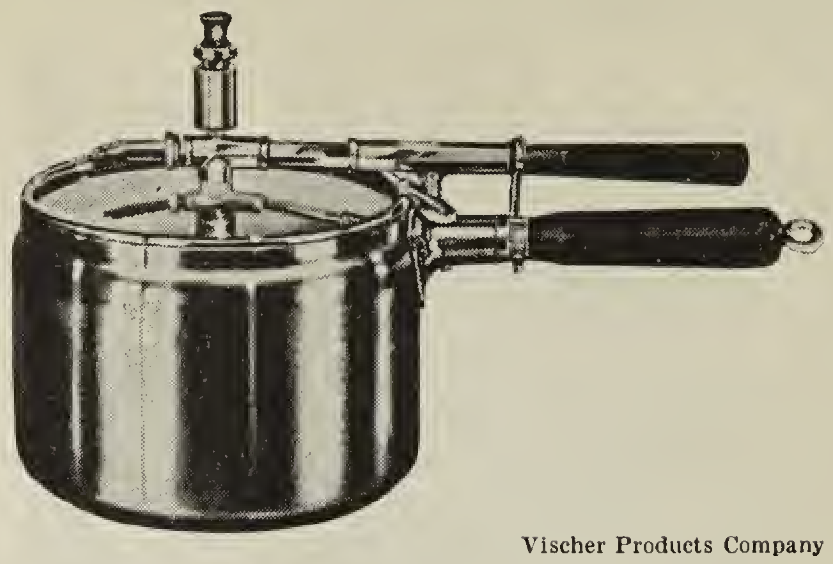
U.S.D.A.

with a very small amount of boiling water. Cover until the vegetable is heated through; then remove the cover to permit the volatile acids to escape. This helps to preserve the color of green leafy vegetables, peas, and beans. In cooking vegetables the color of which is not easily affected, such as yellow and white vegetables, nutritive losses may be prevented by using a minimum of water and by leaving the cover on to prevent evaporation and loss of flavor. Salt is added before cooking. Any left-over stock should be served with the vegetable or utilized in sauces or soups.

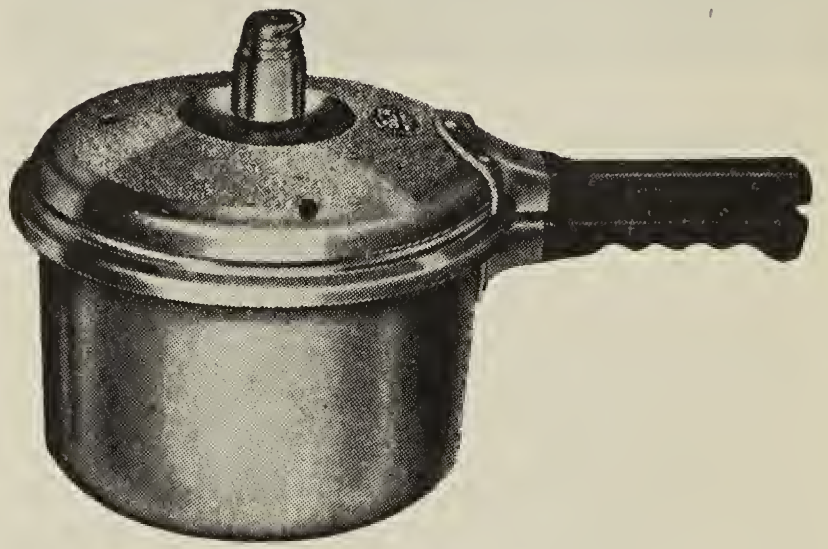
A so-called "waterless method" of cooking vegetables has been advocated in recent years, and special utensils for cooking by this method are sold. These utensils are for top-of-the-stove cookery. They are heavy in order to hold and distribute the heat and are provided with tight-fitting covers to prevent loss of steam during cooking. Any heavy utensil made of a material which holds the heat can be used successfully in waterless cookery. Low heat is used and just enough boiling water is added to prevent burning until the juices in the vegetable form steam. This method is especially useful for watery vegetables, but any vegetable can be cooked in this way if a small amount of water is added at the beginning.

In **panning,** the vegetable is cut into small pieces and cooked in a flat covered pan on top of the range with a little fat to prevent sticking and develop flavor. The water that cooks out of the vegetable evaporates, so that there is no excess liquid. The finished product contains all the soluble nutrients and flavor of the vegetable.

Seasoning and Serving. Methods of seasoning and serving add food value, flavor, and interest to vegetable dishes. Plain with added fat is the simplest and one of the best methods of serving a vegetable. Butter, margarine, salad oil, or the fat from bacon or salt pork may be used. These are added during the cooking of panned vegetables, or after cooking when other methods are used. With most cooking methods the liquor in which they are cooked can be poured over the vegetables. Any excessive amounts should be drained off into the soup kettle. Salt is added during cooking. Chopped parsley, peppers, or any suitable green herb added at the last develops flavor, adds color, and makes for variety and interest.



Vischer Products Company



National Pressure Cooker Company

Typical Pressure Sauce Pans · A pressure sauce pan should have a tight-fitting top, a pressure indicator, and a safety valve. Follow directions that accompany cooker as to the amount of water and cooking time for each vegetable. Never open cooker until pressure is at 0. If necessary to reduce pressure quickly, place cooker in cold water

Sauces frequently are used in serving vegetables. White sauce is combined with the vegetable for creamed vegetables. These sauces are used in the basic proportions of

U. S. Bureau of Home Economics

Panning Okra · Okra cooked with a little added fat develops a good flavor and texture

1 cup of sauce to 2 cups of vegetables. For succulent vegetables, such as carrots, turnips, or onions, a medium sauce is used; but for the starchy vegetables, such as potatoes, a thin sauce is better. The vegetable should be drained before the sauce is added. The liquor should be used in making the sauce, replacing some or all of the milk. (See page 63.) A very little curry powder or chopped herbs added to a white or cream sauce gives variation in color as well as flavor.

When creamed vegetables are placed in a casserole and browned, they become a scalloped dish. Uncooked vegetables may be scalloped by placing layers of sliced vegetables in a casserole, sprinkling each layer with flour, salt, pepper, and fat, and repeating until the dish is full. Then add milk to fill the crevices. The amounts of flour, fat, and milk used should be approximately the same as for a white sauce, that is, with each cup of milk use 2 tablespoons fat and 1 to 2 tablespoons flour, depending upon whether the vegetable is starchy or succulent. Bake slowly, to cook the vegetable and sauce and to brown the top. When buttered crumbs are added to the top of a scalloped dish, it is called au gratin. Cheese may or may not be used.

Hollandaise sauce is served with, rather than over, the vegetable. It is especially desirable with asparagus and broccoli. Hollandaise sauce is a rich tart sauce, high in table fat and egg yolk. Basic proportions consist of $\frac{1}{4}$ pound of table fat to 4 egg yolks and $\frac{1}{4}$ cup of hot water. The yolks, water, and approximately $\frac{1}{3}$ of the fat are cooked in the double boiler over hot water with constant stirring until the mixture thickens. Remove from the heat, add the remaining fat gradually with constant stirring, then season with 2 tablespoons lemon juice, $\frac{1}{2}$ teaspoon salt, and a dash of cayenne. Return to the double boiler if necessary to combine the fat and bring to serving temperature.

A less rich sauce may be made by the use of a medium cream sauce, further thickened with egg yolk and enriched with additional fat. To 1 cup of medium cream sauce, add 2 yolks over hot water, stirring constantly. Then add 2 tablespoons table fat, and 2 tablespoons lemon juice. Season as a true hollandaise sauce. Serve hot over vegetables.

Hollandaise sauce adds richness and color to any vegetables. It is especially attractive with bright-green ones.

Stuffed and Glazed Vegetables. Stuffed cucumbers, egg plant, or onions offer variety and the opportunity to combine flavors. The vegetable is lightly cooked whole. The pulp is removed from the shell, diced and combined with other materials for seasoning, such as fat, nuts, chopped onion, tomato, celery, and parsley, with or without crumbs. The mixture is replaced in the shell, covered with crumbs, dotted with fat, and placed in the oven to complete cooking and to brown the top.

Partly cooked vegetables, such as carrots, parsnips, or sweet potatoes, may be glazed for serving. They are cut lengthwise and placed in a single layer in a baking dish. Any table sirup or a sirup of similar consistency prepared from white or brown sugar is poured over the vegetables to half cover them; butter or margarine and fat are added. The dish is placed in a moderate oven. The vegetables should be turned in the sirup and cooked until they are lightly brown and have absorbed some of the sirup. Any sirup not absorbed should be served with the vegetable.

Left-Over Vegetables. There are various ways of using left-over vegetables. The most common are these: in pan-frying, in fritters (see page 271), in croquettes (see page 146), in custards and as timbales and soufflés (see pages 107 and 112), and in creamed soups (see page 64).

CANNED VEGETABLES

Any of the vegetables not easily stored are available canned. Those most in demand are tomatoes, peas, corn, green beans, lima beans, and asparagus. These withstand processing with the least change. The leafy vegetables lose character at the high temperatures required for processing nonacid vegetables. Sweet potatoes and pumpkins are available canned, largely as a matter of convenience. Cabbage is canned as kraut.

Composition and Nutritive Value. The proximate composition of canned vegetables is much the same as that of an equivalent weight of the fresh vegetable. There may be losses of soluble nutrients resulting from precooking or blanching previous to canning, and the vegetable as it comes in the can is diluted by any added liquid. The high temperature required in processing the nonacid vegetables brings about changes in flavor, texture, and color, especially in the leafy and green vegetables, and a loss in vitamin content, especially vitamin C.

Guides to Buying. The Food and Drug Administration has established definitions and standards of identity: quality and fill for canned peas, other canned vegetables, and canned tomatoes and other tomato products.[1] In addition to the net weight of the contents and the name of the distributor, canned vegetables must state the common name and in some cases the variety of the product and any added ingredient, liquid, spice, or flavoring.

Grades are the best guides to the quality of canned foods. Government purchases are made on the basis of grade, and many institutions indicate grades in writing specifications.

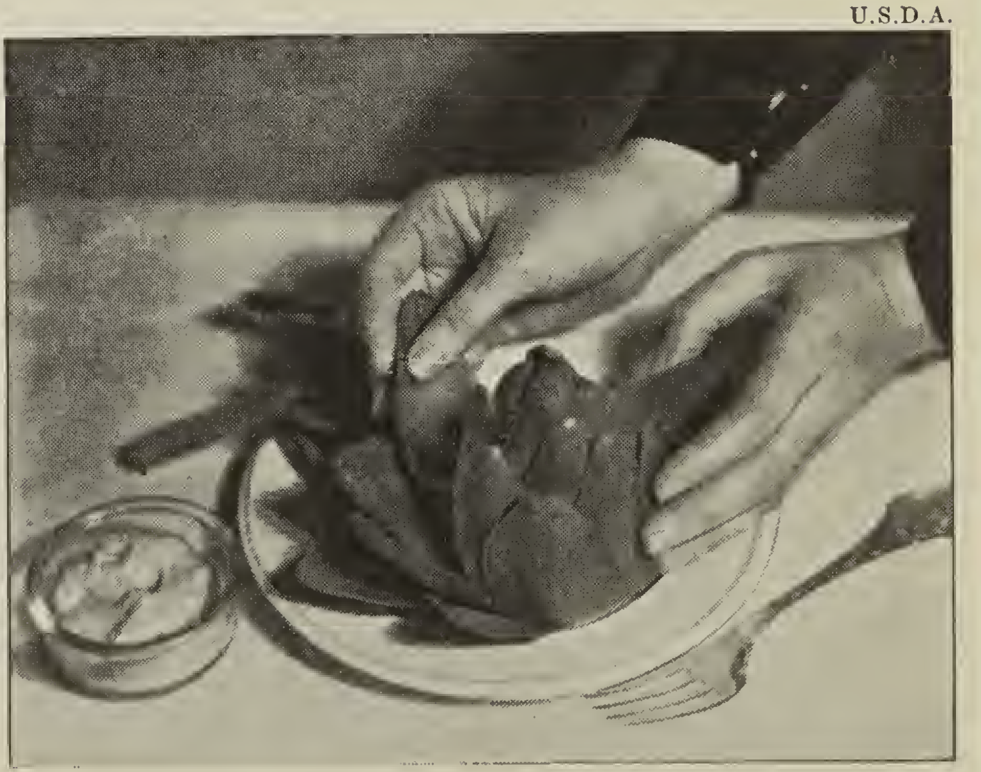
Grades are based on a measure of certain definite quality factors. Not only do they safeguard the consumer, but they also enable her to select the canned vegetable best suited to her particular needs.

The factors considered in establishing better grades or other quality designations in canned vegetables are flavor, color, tenderness and maturity, uniformity of size, clearness of liquid, and absence of defects. These are listed below by letter and the grade designations used by the trade for comparable qualities: Grade A (Fancy), Grade B (Extra Standard or Choice), Grade C (Standard), and Grade D (Substandard).

When canned foods carry the letter

French Artichokes · Hollandaise sauce is frequently served with French artichokes

U.S.D.A.



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[1] *Definitions and Standards for Foods*, Food and Drug Administration Service and Regulatory announcement No. 2, Federal Security Administration, (December 28, 1948).

What's New in Home Economics

Stuffed Eggplant · Stuffed vegetables offer an opportunity to combine flavors

grades[1] above, preceded by "U. S.," the can was processed under continuous factory inspection by the U. S. Department of Agriculture. (See p. 56.) The grades are established by examination of samples from the particular lot which carries the designation. Other products may carry grade designations provided they are of the quality stated. Only when "U. S." precedes the grade have they been inspected by this government service.

Brands are a less accurate guide than grades. Some brands carry grades, and others carry quality designations that roughly approximate grades. Some packers produce different grades of canned vegetables and give a different brand name to each. But studies have shown that some brands are not uniformly of the same grade, and the same brand name may appear on products of different grades.

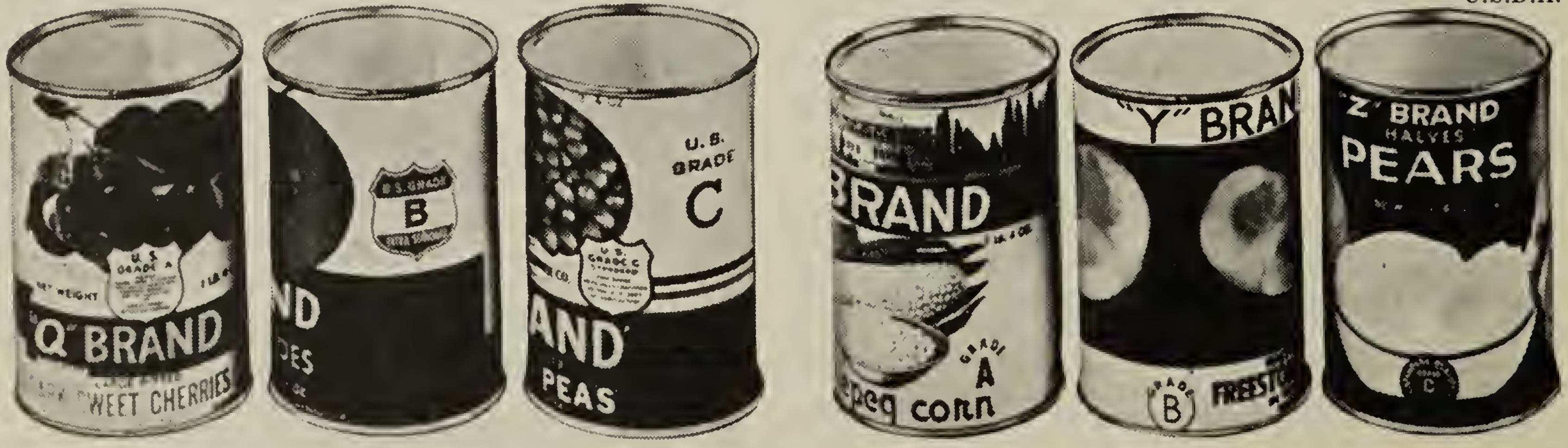
Informative labeling supplies additional facts about the product. These labels are a guide in selecting a product for a particular use. Such information should be pertinent but is not a substitute for a quality designation or grade.

Sizes of Cans. Vegetables are available in various-sized cans, ranging from 8 ounces to 6 pounds. Table XVII gives weights and measures of these sizes. Sizes 2, 2½, and 3 are best for family use, while a No. 10 can is especially suited for use by hotels and restaurants. The weight of the contents is always on the label of the can.

Preparation. All canned vegetables should be carefully inspected on opening. The top of a tin can should be flat or slightly concave. As the container is opened, there should be a

United States Grades of Canned Foods · The prefix "United States" before the grade name means that the product was packed in a plant under the continuous inspection of the U.S.D.A. Government inspectors are on duty all the time. Canners who use the terms "Grade A," "Grade B," and "Grade C" on labels are responsible for seeing that the quality of the product in the can meets the requirements for the specified grade as defined by the U.S.D.A. Otherwise they are liable to penalties for mislabeling, provided under the Food, Drug, and Cosmetic Act

U.S.D.A.



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[1] *A B C of Canned Fruits and Vegetable Labelling*, Miscellaneous Publication No. 460, United States Department of Agriculture, Washington, D.C.

Table XVII · *Common Sizes of Standard Cans for Fruits and Vegetables*

CAN NAME	DIMENSIONS[1]		APPROXIMATE NET WEIGHT[2]	NET CONTENTS, LIQUID PRODUCTS	APPROXIMATE CUPFULS	SOME PRODUCTS FOR WHICH ORDINARILY USED
	Diameter	Height				
No. 1 Tall	$3\frac{1}{16}''$	$4\frac{11}{16}''$	1 lb.	15 fl. oz.	2	Fruits, juices, fish products, some vegetables, specialties
No. 2	$3\frac{7}{16}''$	$4\frac{9}{16}''$	1 lb. 4 oz.	1 pt. 2 fl. oz.	$2\frac{1}{2}$	Most commonly used size—vegetables, fruits, juices, soups, and specialties
No. 2 Cylinder	$3\frac{7}{16}''$	$5\frac{3}{4}''$	1 lb. 9 oz.	1 pt. 7 fl. oz.	3	Tomato juice, fruit juices, some soups, and specialties
No. $2\frac{1}{2}$	$4\frac{1}{16}''$	$4\frac{11}{16}''$	1 lb. 13 oz.	1 pt. 10 fl. oz.	$3\frac{1}{2}$	Fruits, some vegetables, some juices
No. 3 Cylinder	$4\frac{1}{4}''$	$7''$		1 qt. 14 fl. oz.	$5\frac{3}{4}$	Fruit juices, tomato juice
No. 5	$5\frac{1}{8}''$	$5\frac{5}{8}''$	3 lbs. 9 oz.	1 qt. 1 pt. 4 fl. oz.	6	Fruits, juices, some vegetables, and specialties
No. 10	$6\frac{3}{16}''$	$7''$	6 lbs. 10 oz.	3 qts.	12	Vegetables, fruits, juices, some meat and fish products, soups, specialties

American Can Company

sucking-in sound as the vacuum draws in air. Any spurting of liquid or outrush of air is an indication of spoilage. Any food with a dubious odor should be discarded without tasting.

When canned vegetables are reheated for serving, any juice in the can should be used. Canned vegetables may be seasoned and served in any of the ways suggested for fresh vegetables and for left-over vegetables.

FROZEN VEGETABLES

The more popular vegetables are now generally available frozen. Rapid technical development in freezing and in the pretreatment of the vegetables for freezing has improved the quality and decreased the nutritive losses in this method of preservation. The vegetable is gathered in prime condition, prepared immediately for cooking, heated quickly to stop enzymatic changes, and frozen to stay frozen until it reaches the kitchen. Frozen vegetables have come to be looked upon as a better approach to garden freshness than unfrozen ones that have traveled long distances to market. In both flavor and nutritive value frozen vegetables can be superior to any except those produced locally, but they are not always so. As with any new product there are problems which are reflected in the qualities of the product on the market. These problems are being gradually worked out, however, and rapid development can be expected. Among the needed advances would be an adoption by the frozen-food trade of a quality designation on the package. (U. S. grades for frozen vegetables are being developed.)

The vegetables most popular in frozen form are green peas, lima beans, both the small green and the Fordhook, green beans, broccoli, asparagus, and the perishable greens. Other less perishable vegetables are distributed in frozen form, but since they can be shipped fresh with less loss in quality the competition is greater.

U.S.D.A.

Selecting Canned Foods · The intelligent consumer reads the label and notes the grade

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[1] Nominal over-all dimensions; actual dimensions of individual cans will vary within manufacturing tolerances and with type of construction used.

[2] The net weights of various foods in the same-size can will vary with the density of the food. The weight cited is that of foods of medium weight per unit volume.

	Package Contents	Fresh Market Equiva-lent	Portions	Cooking Time
Asparagus	12 oz.	$1\frac{3}{4}$ lbs.	4	8–10 min.
Beans lima	12 oz.	2 lbs.	4	15–18 min.
Beans, green	10 oz.	1 lb.	4	8–10 min.
Broccoli	10 oz.	$1\frac{3}{4}$ lbs.	4	5–7 min.
Brussel sprouts	10 oz.	$1\frac{3}{4}$ lbs.	3–4	5–7 min.
Cauliflower	10 oz.	$2\frac{1}{2}$ lbs.	3–4	4–6 min.
Corn, cut	12 oz.	6 ears	4	5–8 min.
Corn-on-the-cob	4 ears	4 ears	4	Defrost; then cook 5–8 min.
Mixed vegetables	12 oz.	2 lbs.	4	12 min.
Peas	12 oz.	2 lbs.	4	4–6 min.
Peas & carrots	12 oz.	2 lbs.	4	4–6 min.
Rhubarb, with sugar (add more to taste)	12 oz.	$1\frac{1}{4}$ lbs.	4	4–5 min.
Spinach	14 oz.	$2\frac{1}{2}$ lbs.	4	4–6 min.
Squash, cooked	16 oz.	$1\frac{3}{4}$ lbs.	4	Heat in double boiler

Unopened cartons of frozen vegetables may be held in the freezing unit of the refrigerator for several days. They should not be held in the food compartment longer than twelve hours since they thaw in this time. If vegetables have thawed, cook immediately. It is unsafe to hold or refreeze these vegetables after thawing.

Heating Canned Vegetables for Service · Always use the juice in the can. It contains valuable soluble nutrients

Frozen vegetables are partially cooked and so require a shorter cooking time than unfrozen ones. The simplest method of cooking is to add the unthawed vegetable to a small amount of boiling water salted to taste. For the ten- to twelve-ounce package use a two-quart pan and the amount of water suggested on the package, usually $\frac{1}{3}$ cup. The time of cooking is indicated in table opposite.

DEHYDRATED VEGETABLES

During the war considerable effort was put into the development of dehydrated vegetables, because of the ease of storage and the decreased shipping space they required. Except in condensed soups and in seasoning mixtures, few of them have reached the consumer market. Dried beets were a particularly promising product.

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VI · Cereals and Cereal Foods

Cereals are seeds of the grasses. They are high in nutritive value, since they contain in small bulk all the building and energy-yielding materials necessary for the development of the new plant. Cereal grains in some form are produced in every country. The ease with which they are stored and transported contributes to their ready availability and low cost as compared with more perishable foods.

The cereal most economically produced in any area tends to be the one most used, and the food habits of the people adapt themselves to it. On a world basis, rice is the cereal most used for human consumption. In some Oriental countries 80–90 per cent of the food calories are supplied by rice.

In much of Europe and the temperate zones in the Americas, wheat grows abundantly, and has come to be the preferred cereal because of the quality of the bread made from it. In north Europe it is replaced by the more hardy rye.

In the tropical Americas, corn is the native cereal, and the tortillas prepared from it make up a large part of the food in these countries. In the southern United States, where corn is grown more successfully than wheat, it has always been a staple part of the diet.

COMPOSITION AND NUTRITIVE VALUE

All cereals are good sources of energy and contribute important amounts of other food nutrients. A large part of the food supply in countries and areas with low family incomes is in the form of cereals or products prepared from cereals. This direct use of cereals for food is sound economically. It is sound nutritionally only when the cereal is so selected and processed as to make its maximum contribution to the diet in required nutrients, and when the remainder of the diet can be chosen to provide the nutrients lacking or supplied in inadequate amounts by the cereal.

In every country cereals and cereal products make up a large part of the diets of low-income groups. As the amount spent for food increases, there is a tendency to replace cereals with foods such as fruits, green vegetables, milk, eggs, and meat, which have more flavor and more of the nutrients not present in adequate amounts in cereals.

Composition. When cereals are fully matured and properly stored the water content is usually about 10 to 12 per cent. This low percentage of water contributes to the ease of storage and the readiness with which cereals can be shipped.

The **protein** content varies in both kinds and amounts, averaging about 12 per cent. Oats are highest and rice lowest in protein content. While the cereal proteins belong to the so-called "inefficient group," they are exceedingly valuable supplements to the efficient proteins in milk, meat, and eggs. Studies show that the proteins in oats rank highest in quality, followed by rice and rye; then wheat and corn.

The **carbohydrate** in the grains is largely in the form of starch. This may be separated and used as such. The characteristic properties of the starches have been considered. The energy value of cereals is contributed in large part by the starch and fat.

The amount of **fat** varies widely among the different grains. Those with the highest fat content, oats and corn, are the ones with the highest energy value. While the fat is stable in the unmilled grain, it is quite unstable in the milled cereal products. For that reason processing methods have been developed which discard the germ, the portion of the grain highest in fat. This increases the stability of the product, but at a sacrifice of nutritive value, since the germ portion is a valuable source of protein, minerals, and vitamins as well as fat.

Minerals are abundant in all cereals. The seed must supply enough for the development of the new plant until it is able to absorb needed minerals from the soil. The average amount is about two per cent of the weight of the grain. Calcium, phosphorus, and iron are the minerals present in largest amounts. Other common mineral as well as traces of other elements also are present. The kinds and amounts vary with chemical and physical factors in the soil on which the grain is produced.

The proximate composition of the grains which are used most for food is given in Table XVIII.

Vitamin Content. In addition to these proximate components, the cereals are the valuable food sources of the B vitamins—thiamine, riboflavin, and niacin—and the less well-known factors in this group. They contain practically no vitamins A, C, or D.

When cereals are sprouted, some vitamin C is formed, the amount depending upon the conditions under which sprouting takes place. Also during sprouting the B vitamins are increased. The Russians, during the long siege of Leningrad, improved both the flavor and the nutritive content of their diet by sprouting, before use, the cereal which made up most of their limited food supply. Native groups living in the tropics have developed methods of improving the nutritive value of their diets by sprouting or fermenting the basic cereal component.

USES OF DIFFERENT CEREALS

The form in which the cereals are used varies. In some the whole or partially crushed grain is cooked and eaten as a porridge or thick mush. Some cereals are ground to a meal or flour for use in breadmaking. In the United States a variety of breakfast foods are made from cereals.

Wheat. Wheat is by far the most important of the grains for breadmaking, owing to the presence of two proteins, gliadin and glutenin, which unite when moisture is added to form a substance with elastic properties called "gluten." The presence of these gluten-forming constituents makes the flour from this grain especially desirable for bread. The different kinds and grades of white flour and

TABLE XVIII · *Composition of Some Common Grains*

	Water	Protein	Fat	Carbohydrate	Fiber	Minerals
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Wheat	13.90	12.31	2.15	63.32	2.17	2.15
Oats	10.86	12.15	4.33	57.93	12.07	3.46
Oats (hulled)	6.93	14.31	8.14	67.09	1.38	2.15
Barley	11.90	10.50	2.20	72.80		2.60
Corn	10.70	10.00	4.30	71.80	1.70	1.50
Rice (unhulled)	10.28	7.95	1.65	65.60	10.42	4.09
Rice (polished)	12.34	7.18	.26	79.86	.40	.46
Buckwheat	12.30	10.70	2.00	62.80	10.70	1.80

their use in breadmaking will be considered later (chap. XX). Wheat is used also in breakfast cereals and alimentary pastes, such as macaroni and noodles.

Corn. Next to wheat the grain most used in the United States is corn. It is grown extensively in the Middle West and South and to a lesser extent in other parts of the country, for both animal and human feeding. It is almost as high in energy value as wheat, and ranks next to oats in the amount of fat contained. The protein content is lower than in some of the other grains. Corn is used in the diet in many different forms, the most familiar being corn meal, hominy, and grits. Some corn is used in prepared breakfast cereals. Cornstarch, corn oil, corn sirup, and cerelose (corn sugar) are being manufactured from corn in increasing amounts.

Rye. Rye contains one of the gluten-forming constituents, and so is consumed largely in the form of bread. It makes a bread that is more moist and less porous in texture than that made from wheat flour. Since rye flour contains the whole grain it is dark in color. In some portions of northern Europe it is the basic bread cereal. In this country rye bread is usually prepared from a combination of wheat and rye flours.

Oats. Oats have high food value because of their content of protein and fat. This cereal does not contain the proteins which form gluten and, therefore, is not used for bread to such an extent as wheat, but is used in the manufacture of breakfast foods. Since these are made from the whole grain with only the husk removed, they are a nutritious food. Oats in various forms have long been a staple article of diet among the Scotch, and the sturdy health of these people has been attributed in part to their use of this cereal.

Rice. In warm, moist climates where rice grows most abundantly, it is used as the basic cereal component of the diet. In parts of Asia and the Pacific islands, rice supplies from 70 to 90 per cent of the energy in the diets. While extensively used in the Near East, tropical Africa, and parts of the Americas, in these areas it enters into competition with other cereals and starchy roots.

In this country the consumption of rice is relatively small except in certain Southern states. There it is used as a starchy vegetable rather than as a cereal and tends to replace potatoes rather than bread. Rice, in grain form, cooks so quickly that it is largely used in this form and is present only to a limited extent in manufactured products. The forms available and methods of processing the grain for use will be discussed in a later section of this chapter.

Barley. Barley is characterized by high mineral content. It is low in fat and protein. Barley is seldom used in this country as a human food, except in the form of the whole grain in soups. The large amount of starch-digesting enzyme present in barley makes it especially useful in the fermentation industries. The sprouted or malted barley is extensively used in the manufacture of beer and yeast to change starch into sugar.

Other Cereals. While millet is rarely used in this country as human food and buckwheat only as a pancake flour, they are both important foods in eastern Europe, northern Africa, and northern Asia, where they are used whole or partly crushed in thick porridges or steamed breads. While buckwheat is not a true grain, it is used in the same way as cereals. Buckwheat groats are available in this country in shops supplying foreign groups.

PARTS OF THE GRAIN

In considering the use and food value of products prepared from the grains, it is important to know that in every seed there are distinct portions which vary from one another in composition. When cereals are milled, certain portions may be discarded wholly or in part, and in this way it is possible to obtain from the same grain products varying widely in composition. The different parts of typical grains are shown in the illustrations on the opposite page.

Every cereal has three distinct portions: the outside, or protective layers; the inner portion, or the endosperm; and at one side or end, a small dark portion called the germ.

Bran Layer. The protective coat is usually referred to as the bran layer. It is composed largely of cellulose in which there has been deposited a certain amount of mineral substance which gives rigidity. As separated in the milling of different cereals the bran may contain valuable amounts of high-quality protein, minerals, and the B vitamins. Closely associated with the bran layers in some cereals is the aleurone layer. While this is a part of the endosperm, it is removed with the bran and contributes to it valuable protein, minerals, and vitamins.

There is considerable difference of opinion as to the value of the retention of all or even any of the bran layers in the milling of cereal because of the high cellulose content of this portion. Since the cellulose is largely undigested, it increases the bulk of the food residue and aids in the retention of water, both of which are desirable as they promote normal elimination. When the form and amount of this cellulose are irritating to the delicate lining of the intestinal tract, its use should be avoided. Too much roughage may interfere also with the complete absorption of the nutrients from a mixed diet.

Germ. From the germ portion the new plant develops. In this small part are found protein, minerals, vitamins, and fat. While highest in food value, this is the most unstable portion of the grain. Along with the high fat content, it contains the enzymes necessary to release the energy and change the stored materials into the forms needed by the new plant when conditions of moisture and temperature are right. Because of the instability of this portion it frequently is removed during milling.

As this nutritive value of cereal germs has come to be recognized, various methods of stabilizing this portion have been developed, the most promising of which seems to be the removal of fat. Defatted cereal-germ products are now available in inexpensive form since the fat removed has important industrial uses. These products are high in good-quality protein, minerals, and the B vitamins, and wide use might well be made of them to improve diets lacking the B vitamins and protein. Wheat germ may be obtained from the local flour mill. If kept dry in dark containers and at a low temperature (45° to 50° F.) it can be held for some time without becoming rancid.

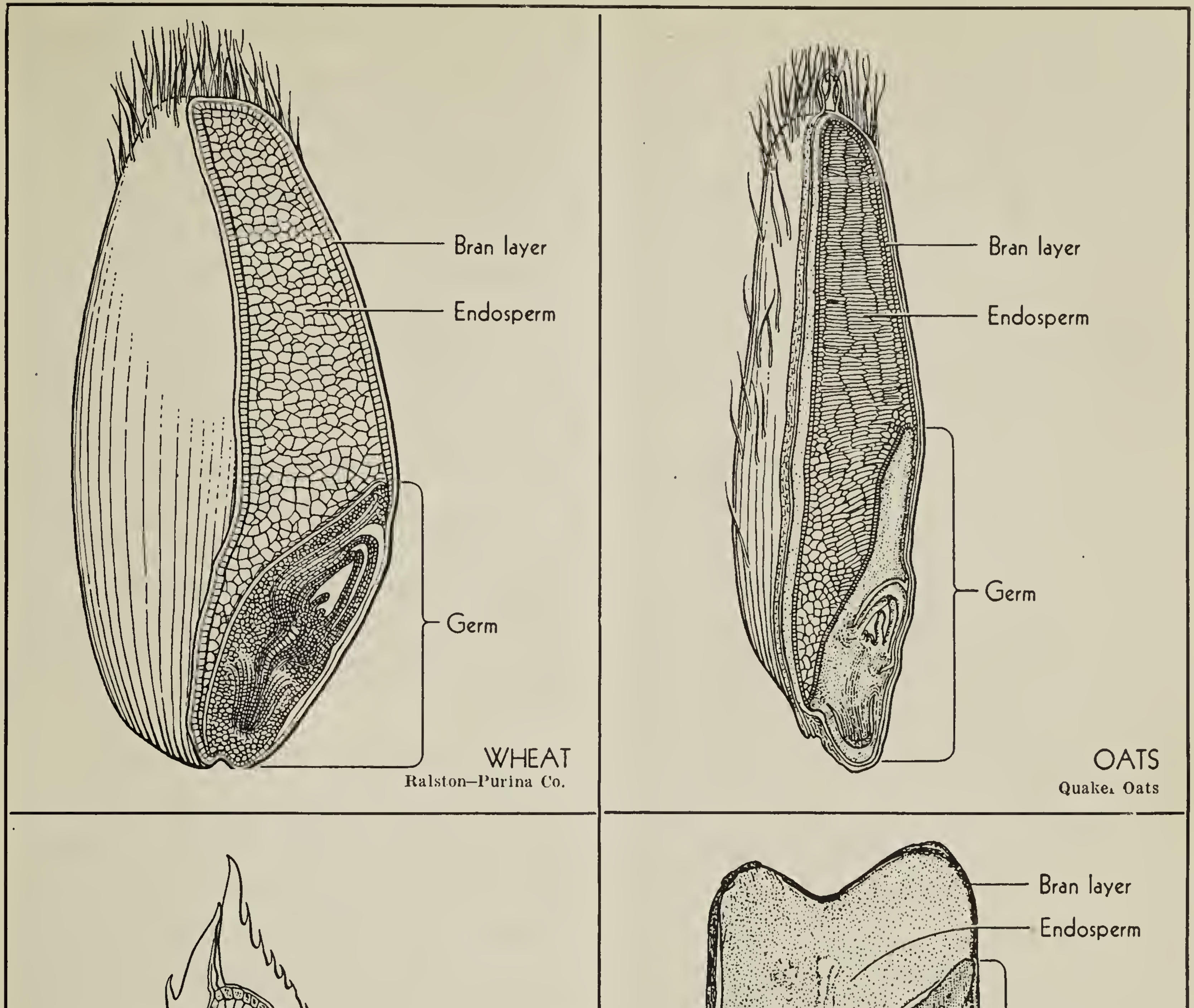
Rice polish, a by-product from the milling of rice, sold for cattle food, contains the germ of the rice. It is also high in mineral content and is an especially rich source of the B vitamins.

Endosperm. The endosperm is largely a storage place for energy and such additional building material as the plant may need as it develops. Here the energy is stored in the form of starch. Proteins are present, and some minerals and vitamins, though considerably less than in the germ portions.

CEREAL BREAKFAST FOODS

Cereals are now available in a group of manufactured products known as "cereal breakfast foods." These are divided into two groups: the ready-to-cook and the ready-to-eat.

Ready-to-Cook Cereals. The simplest of the breakfast cereals are the old-fashioned porridges prepared by cooking whole or partly ground cereals in water or milk to a thick mush. Because of the instability of ground whole-grain products, these are not often



WHEAT
Ralston–Purina Co.

OATS
Quaker Oats

RICE
University of Arkansas

CORN
U.S.D.A.

Diagrams of Cereal Grains

available in packaged form. Some small mills provide them during the winter months as whole ground corn meal, cracked wheat, or coarsely ground whole wheat. Farm families, with their own grain supply and small mills, grind their own. Cleaned whole wheat, if available, may be cooked in pressure sauce pans.

Specially selected and processed wheat and oat cereals are available in the form of rolled oats and, to a limited extent, rolled wheat. These are whole-grain cereals.

Rolled cereals are prepared by passing the whole groats through a steam chamber onto the rolls. The regular or old-fashioned rolled products are prepared from whole groats. For the quicker-cooking variety of rolled oats, each groat is cut into three portions and put through closer-set rollers. This yields smaller and thinner grains. Both regular and quick-cooking rolled oats are prepared from the whole grain, and have identical nutritive values. The designation "whole grain," applied to a breakfast cereal, means one which contains the natural proportions of bran, germ, and endosperm and has the same nutrient content as the unprocessed grain or grains from which it is made.

Other cereals to be cooked contain selected portions of the grain. These fall into groups designated as "farina" and "granular wheat cereal." Farina contains only the endosperm portion of the wheat ground to a meal. The granular cereals are more coarsely ground than farina and contain other portions of the grain.

The time required for cooking these cereals may be shortened by the addition of disodium phosphate, which hastens the gelatinization of the starch. Other ready-to-cook cereals are made quick-cooking by a some what finer grind.

Some packaged cereals are enriched or restored by the addition of selected nutrients. They are designated as "restored" when sufficient amounts of thiamine, niacin, and iron have been added to give a product with the accepted whole-grain level in these three nutrients. They are designated "enriched" when these three nutrients are added in larger amounts than are present in the whole grain or when other nutrients are added.

Ready-to-Eat Cereals. There are a wide variety of ready-to-eat cereals on the market. They vary with the grain used, the part of the grain, and the method of processing. All are precooked so that the starch is largely dextrinized, and most of them have a crisp texture. These appear as flakes which may or may not have added bran, as crisp cereals, and as puffed cereals. Twice-baked products are available as shreds, flakes, or kernels. The ready-to-eat cereals also may be restored or enriched.

SELECTION AND BUYING

In selecting a breakfast cereal the first decision is between ready-to-cook and ready-to-eat. This is largely a matter of preference and time. Even the quick-cooking varieties do require time, but a hot cereal frequently hits the spot, especially during the winter months.

The comparative cost is best determined by records of original cost, weight of contents, and the number of servings. Where time is a factor, compare the time required for cooking of the one with that required for crisping or heating the other when that is necessary. In general, the ready-to-cook cereals are the better buys. Remember the weight of the contents is more important than the size of the package. A large package may contain less cereal by weight than a smaller one.

Practically all cereal breakfast foods are now available in packages of varying sizes down to those containing single servings. The size to be selected will depend upon the size of the family and the amount of cereal used. One pays for packaging, and cereals in small packages cost relatively more than the same amount of cereal in one large package. Unless some members of the family are partial to particular kinds, avoid having too many kinds on hand at one time. One or two ready-to-cook and one or two ready-to-serve should be sufficient. Get variety as supplies are replenished.

CARE AND STORAGE

Store cereals in the original package in a cool, dry place. In this way they are easily located, and the directions for cooking the ready-to-cook kinds are readily available on the package. In opening ready-to-eat cereals avoid tearing the inner wrapper. This can be unfolded to pour the amount needed, and refolded to protect the crispness of any left in the package.

COOKING BREAKFAST CEREALS

The purpose of cooking cereals is to gelatinize the starch and soften the cellulose. This improves flavor and texture and contributes to the ease and completeness of digestion. As the starch gelatinizes it absorbs water and the mixture thickens. Enough liquid should be added to cereal so that it will have the consistency of a thick mush when cooked. The cereal should be combined with the liquid in such a way as to avoid lumps, and the cooked cereal should be served piping hot.

Cereal foods vary in the amount of water required. The amounts required for packaged cereals have been carefully determined and are stated on each package. Follow these directions carefully.

To prevent lumps, finely ground cereals, such as farina, granular wheat cereals, or cereal meals, should be combined in the same way as starches. That is, add enough cold liquid to the dry cereal to separate the grains. The remainder of the total liquid should be brought to a boil, and the cereal mixed with cold water poured in with careful stirring. After it has returned to a boil directly over the fire, place over hot water to continue cooking or hold at serving temperature. Many packaged cereals are now quick-cooking. Some of these, however, are improved in flavor by longer cooking.

To reheat cold, cooked cereal such as farina, granular wheat cereal, oatmeal, or rolled wheat, use a covered double boiler. Do not stir until the cereal is well heated. If it is too thick, add a little hot water.

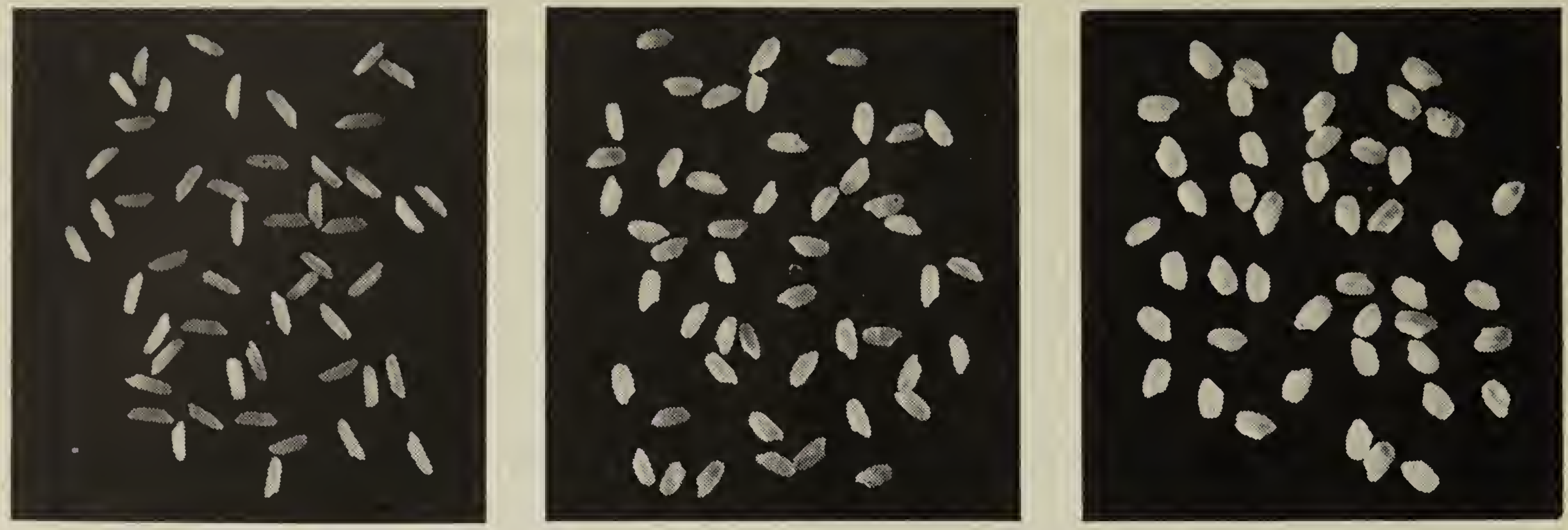
To heat ready-to-eat cereals or to restore crispness in damp weather, pour the cereal into a shallow baking pan. Place in a moderate oven (350° to 375° F.), leaving the door slightly ajar. Never put the package in the oven.

Shredded cereals may be heated either in the oven or by dipping the biscuits quickly into salted boiling water. Remove from water, drain, and serve at once.

RICE

A number of varieties of rice are grown in the United States. These have been developed largely on the basis of yields and resistence to breakage in milling. Increasing attention is being given to cooking quality and nutritive value in the selection of new varieties.

Varieties. Rice varieties are grouped as long grain, medium grain, and short grain. The leading American long-grain varieties are Rexoro, Fortuna, Nira, Bluebonnet, Prelude, and Texas Patna; in the medium-grain group, Blue Rose and Venus; and in the short-grain, Calora, Cody, and Calusa. These varieties may require slightly different cooking times, and so should not be mixed in packaged rices. Blue Rose is the rice sold in largest quantity and frequently this name appears on the package. The distributors and



Long grain *Medium grain* *Short grain*

Types of Rice

institutional users, who buy in quantity and on specification, usually specify variety; but other than Blue Rose, variety names do not often appear on consumer packages. Different sections prefer types to which they are accustomed.

Milling. Rice reaches the consumer as "milled rice."[1] In milling, the hulls, the germ, and most of the bran layers are removed. Milled rices are designated as brown or white, depending upon the extent of milling.

It has long been known that rice suffers serious loss in nutritive value in milling. In countries where rice makes up a large proportion of the diet, there was a wide occurrence of the deficiency disease known as "beriberi," which results from too little of the B vitamin, thiamine. This deficiency disease was less prevalent in areas where the rice was milled by hand than in areas where it was milled by machinery. Hand-milled rice is less completely milled, and, used freshly milled, it retains fair amounts of the essential B vitamins. Also it was observed that in areas where rice was parboiled before milling, beriberi rarely occurred.

The development of the commercial milling of rice with mechanized machinery has produced a whiter, more completely milled rice, but has increased the incidence of beriberi in areas where rice makes up a large part of the diet. It was found that preparations made from the material removed in milling (called "polishings") could be successfully used to prevent these conditions. With increasing knowledge of vitamins, rice polishings were found to be one of the richest sources of the B vitamins, not only thiamine but the other members of this group. Efforts have been made to develop milling methods that would retain these nutrients in the rice as it reached the consumer.

The first method of doing this was undermilling. For many years undermilled rice has been required for army and institutional feeding in the Philippines. During the Second World War both China and Japan required that all national supplies of rice purchased be undermilled. The degree of undermilling was designated by the percentage and by the weight of the bran coat left. The usual requirement was for 30 per cent undermilled rice. Rices so prepared do not have the accustomed white color, are more subject to insect attack, and deteriorate in flavor more quickly than white rice.

[1] U.S. Standards for milled rice were issued September 4, 1946, by the Production and Marketing Administration, United States Department of Agriculture, Washington, D.C.

They are distributed in this country as brown or undermilled rice.

In view of the experience with parboiled rice, studies were made of the effect of this method of pretreatment on the milling quality of rices, and the nutritive value of the milled parboiled rices as compared with milled raw rices. The original methods of parboiling were hit or miss, and did not yield a standard product. As the result of considerable study, standard parboiling methods have been developed. The rice milled after this treatment is clear and slightly amber in color, but cooks to a creamy white product. More important, rice parboiled before milling retains from 50 to 75 per cent of the original vitamin content, as compared with 10 to 20 per cent in raw milled white rice. Other nutrients, protein and mineral, in the bran coat also are retained better. Further, this rice is resistant to insect attack, is more stable, and has a good cooking quality.

For many years a form of rice called "Patna" was allowed to enter this country duty-free, for use by the soup industry. It was thought to be a variety, and the manufacturers of soups asserted native varieties could not be used, since they produced a cloudy soup. It has now been shown that Patna was not a variety, but a long-grained rice parboiled before milling.

Milled parboiled rices now are being produced in this country. Until recently they have all been reserved for army use. They now are being produced in increasing amounts as both converted and parboiled rice, and as the amount required for army use has decreased, more of this rice has been available on the consumer market.

Cooking. The aim in cooking rice is to make the grains tender and swell them to capacity without breaking. Each grain should stand apart and not be sticky or gummy. It also should be prepared so as to conserve the nutrients not lost in milling. In raw milled white rice and milled raw brown rice the soluble nutrients are in the outside coats. They are removed by washing and by discarding excess cooking water. In packaging rice should be so handled that it requires no washing before cooking. Cooking methods should be used which regulate the amount and evaporation of the water so that none remains to be discarded when the rice is ready to serve.

An interesting story from the Philippines illustrates this point. Two groups of a Catholic order, one composed of nuns, the other of friars, were supplied from the same lot of undermilled rice. Cases of beriberi appeared among the nuns, none among the friars. The answer was in the method of preparation. The nuns washed the rice before cooking. The friars cooked it without washing, little knowing that in this way they were retaining the essential thiamine and preventing the occurrence of beriberi in the group.

With different rices, the amount of water and the cooking time will vary slightly. The amount of water a rice will absorb and the time of cooking have been carefully determined for most packaged rice, and these are indicated on the package.

In general, rices require about twice as much water as rice by volume. The water is heated to boiling with the addition of ½ teaspoon salt to each cup of water. To maintain a boiling temperature, the unwashed rice is added slowly. After all has been added, the sauce pan is covered, and the heat is reduced to allow the rice to steam without sticking. When the grains have swollen to full size, the cover can be removed to allow any excess water to escape while the rice continues cooking over very low heat. **Avoid the use of methods that require several volumes of water and draining of the excess after cooking.**

Rices require from 20 to 30 minutes cooking time. This will vary with variety, with the age of the rice, and with the milling method. The cover should be removed to allow any excess water to evaporate and the grains to separate during the completion of the cooking over very low heat.

Rice is served alone with butter or gravy. In a Chinese meal, it is served separately and combined as eaten with the various other dishes that provide flavor and supplement the nutrients found in rice. In this country, rice is used also in many mixed dishes.

MACARONI PRODUCTS

Macaroni is a cereal product made from a flour of high gluten content specially suited to the manufacture of macaroni. This flour is mixed with the smallest possible amount of boiling water, is well kneaded, and then pressed through cylinders into the form desired.

Macaroni is in tubular form, at least .11 inch and not more than .24 inch in diameter. Spaghetti and vermicelli are rods, the first not less than .06 inch and not more than .11 inch in diameter. Vermicelli is less than .06 inch in diameter.

The Food and Drug Administration has established definitions for wheat, whole wheat, and wheat and soy macaroni products. These are cut off in suitable lengths and dried in special rooms where the amount of moisture can be controlled. There are also other forms for macaroni products such as sea shells and elbows.

These products should be cooked in gently boiling, salted water until tender (about 10 minutes), and drained. They should be tender but not pasty, and each piece should be distinct. The cooked product is seasoned and served according to taste. Since these products have little flavor of their own, butter or margarine and grated cheese, a well-seasoned sauce (cream or tomato sauce), or a combination of these is usually added. The cooked product may be served alone, with butter and grated cheese added as desired, in accordance with the Italian custom; the sauce and cheese may be combined before serving; or a baking dish may be filled with alternate layers of the cooked macaroni, grated cheese, and a sauce, with a covering of buttered crumbs over the top, and browned in the oven or broiler.

NOODLES

Noodles, formerly a home-prepared product, are now available in packages on the market. They are made from a very stiff dough. In egg noodles the egg provides the only liquid. Noodles are cut in strips or special shapes. Special seasonings are added to noodles for use in soups. They are cooked like the macaroni products. When used in soups they are cooked in the soup.

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VII · Eggs and Egg Cookery

The function of the egg in nature is the development of the new chicken. It is not surprising, therefore, to find that the egg contains all the materials necessary for body-building.

Eggs of many different fowls, birds, and reptiles have been used as food by various peoples at different times. Now, however, the use of the term **egg** as an article of food, if unqualified, refers to eggs from one source, the hen (chicken). Other eggs are very rarely on the market. A chart on page 222 gives for the United States the per capita production of eggs over a period of years.

APPEARANCE AND PHYSICAL STRUCTURE

The egg consists of three distinct parts: the shell, the white, and the yolk. In addition to the shell, there are two shell membranes surrounding the egg contents. As the egg cools and the contents contract, an air cell is formed between these two membranes, usually at the large end of the egg. One can easily distinguish three types of white: the thick portion, the thin portion, and the chalazae, or cords. On the yolk can be seen the germinal disk commonly called the "germ spot."

The shell makes up approximately 11 per cent, the white 58 per cent, and the yolk 31 per cent of the whole egg. These percentages vary with eggs from different sources, but there is little variation in day-old eggs. The shell is heavier when there is an abundance of calcium in the diet of the hens or when the hens are fed a diet rich in vitamin D.

Eggs vary in weight or size according to the breed and age of the hen. The average weight of a large egg in the shell is about two ounces (56 grams), or eight eggs to the pound. Medium-sized eggs weigh 20 ounces to the dozen and the smallest eggs about 18 ounces.

The Shell. The color of the shell varies from white to brown, depending upon the breed of hen. Some foreign breeds produce eggs with a bluish shell. In some markets white-shelled eggs receive a higher price than brown-shelled ones, and in other markets brown-shelled eggs are preferred and cost more. However, there is no difference in composition, palatability, or cooking quality of eggs due to the color of the shell. Shell color is a breed characteristic and is not a guide to the color of the yolk.

The shell is composed chiefly of the carbonates and phosphates of lime. It is porous in structure and, therefore, permits the escape of moisture with absorption of air, and, when eggs are not properly handled, the entrance of microorganisms. The shell normally is coated with a mucilaginous substance which helps protect the contents from evaporation and contamination.

The White. Fresh egg white has an opalescent appearance, and when the egg is broken onto a flat surface the white next to the yolk is thick and viscous and tends to hold its shape, while that on the outer edge is less viscous and thinner. As the egg ages or if it is held at too warm a temperature, the thick white tends to become thin.

In general, eggs with thick white beat up

Table XIX · *Proximate Composition of Eggs*

	Water	Protein	Fat	Ash
	Per cent	*Per cent*	*Per cent*	*Per cent*
Whole egg, E. P.[1]	73.70	13.40	10.50	1.00
White	87.77	10.00	0.05	0.82
Yolk	49.00	16.70	31.90	1.90

better than those with thin. Certain hens consistently produce eggs with thin or watery whites.

The Yolk. The yolk is anchored near the center of the egg by dense cordlike strands of white, called the chalazae, so that the yolk can revolve on its axis. The yolk in a fresh egg is round and upstanding. It is separated from the white by a membrane. As the egg deteriorates in quality, the yolk absorbs water from the white, swells, and tends to flatten. Finally a stage is reached at which the yolk breaks through the separating membrane and the two portions combine. On the surface of the yolk, a small light spot, called the "germ spot," may be seen. When an egg has been fertilized, the germ develops at this point. As the yolk swings in its hammock made by the chalazae, gravity holds the yolk so that the germ spot is always on top—a plan of nature whereby the germ spot is always nearest the body of the hen as she sits on her eggs.

For the production of market eggs, the male birds are usually separated from the rest of the flock in order that infertile eggs may be produced. Infertile eggs keep better than fertile eggs.

The color of the yolk varies from very pale yellow to deep orange, depending upon the food of the hen. The pigment of the yolk is chiefly xanthophyll, with carotene and cryptoxanthophyll present in small amounts. Hens fed in pens away from green food tend to produce eggs with light-colored yolks, while hens on range produce eggs with deep-yellow yolks. Alfalfa meal and large amounts of green food in the ration produce dark-colored yolks. Some feeds, such as cottonseed, produce olive-green yolks.

COMPOSITION AND NUTRITIVE VALUE

Eggs vary considerably in composition according to the breed of the hen, the season, and feeding. The figures in Table XIX give the average proximate composition of eggs.

The important points to remember about the composition of eggs are that (1) the yolk is approximately one third of the edible portion of the egg, and the white two thirds; (2) there is more total protein in an egg white than in a yolk, although the percentage is higher in the yolk; and (3) practically all the fat in the egg, 10.5 per cent, is in the yolk, which is about 32 per cent fat.

Nutritive Value. Eggs are important as food because of their high nutritive value. Only the important nutrients contained in eggs are discussed here.

Efficient Protein. Eggs are a good source of efficient protein, that is, protein of high biological value. The protein of the white is chiefly albumin, one of the complete proteins. The protein of the yolk is mainly ovovitellin, another high-quality protein. Egg proteins furnish all ten of the amino acids essential for building body protein.

Energy. As a source of energy, eggs are not especially important. The edible part of the egg yields about 715 calories per pound, which means approximately 635 calories per pound as purchased (eight large eggs). This would be about 75 calories for each large egg or 70 calories for a medium-sized one. The energy value of the egg is due to the fat and protein content. There are no carbohydrates in eggs.

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[1] E. P. means "edible portion."

MINERALS. The iron content of egg yolk is high compared with most other foods. This iron is present in a form highly available to the body. Although the amount of iron in the white is low, the yolk is rich enough to make whole eggs an excellent source of this important blood-building mineral.

Eggs also are rich in phosphorus, but are not good sources of calcium.

VITAMINS. Eggs are an important source of several of the vitamins essential to good nutrition. The yolk contains vitamin A, thiamine (B_1), riboflavin (B_2), niacin, and others of the B-complex group. In the white, riboflavin is the only one of the known vitamins found in appreciable amounts.

The diet of the hen is an extremely important factor in determining the amount of these different vitamins present in the egg. Though many food products having a yellow or orange color are rich in vitamin A, the intensity of the color of egg yolk is not a reliable indication of its vitamin-A value. Eggs from hens having a diet abundant in green leafy feed will have deep-yellow yolks, providing a high concentration of pro-vitamin A, which can be converted into A itself in the body. Yellow corn in the diet of the hen increases the depth of color of the yolk, yet provides less pro-vitamin A than green leafy feed. On the other hand, eggs from hens on a diet low in pigments, but containing considerable fish-liver oil, will have light-colored yolks rich in vitamin A.

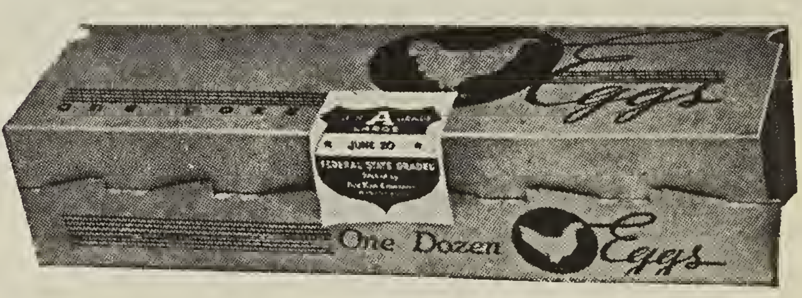
With suitable feeding practices, eggs of high vitamin-D content are produced. This vitamin, if present, is in the yolk. The standard ration used today by poultrymen is planned to provide eggs of high quality, rich in vitamins.

Digestibility. In general, eggs are easily and completely digested. Slight cooking increases the digestibility of eggs, especially when the cooking is done at a temperature below the boiling point.

Use in Diet. Eggs have an important place in the diet; they supply high-quality protein, vitamin A, thiamine, riboflavin, iron, and phosphorus. In addition to their nutritive value—important as that is—eggs play an important role in cookery, increasing the attractiveness of many foods in a variety of dishes. Eggs are useful in emergencies because they can be cooked quickly in many ways.

SELECTION AND BUYING

Eggs, like meat and milk, require care in both production and handling to insure a quality product. Standards for quality have been established by the United States Department of Agriculture and are being used in many places. The purpose of grading eggs is to classify or sort them according to (1) size, (2) shell condition, and (3) interior quality. Grading may provide the basis on which payment is made to producers and an incentive to give the best possible care to his eggs. The practice of buying on grade from producers is increasing fairly rapidly in some sections of the country.



A Standard Egg Carton · The label that seals the carton shows the grade and size of the eggs and the date on which graded

Grade labels on the package furnish the consumer with a guide to selection, giving her an opportunity to choose with discrimination, and to spend her money wisely, assuring her that she is getting the size and quality of eggs best adapted to her use and pocketbook.

U.S.D.A.

Candling Eggs · Interior of egg-candling room showing how eggs are held before candling light

Candling is the only commercially practical method of determining interior quality on which egg grades are based. To observe each egg, the candler holds it against an opening in front of a light. This originally was a candle, hence the name. Now a 40–75-watt electric light is used. This reveals the appearance of the inside of the egg. An experienced candler can tell with a reasonable degree of accuracy the condition of the egg content. The egg should be twirled as it is placed before the candling light. This will cause the yolk to move within the white. Defects on the yolk and foreign material in the white can thus be seen more easily; the size and shape of the yolk as well as its outline can be determined readily. The size of the air cell also should be noted as a measure of evaporation.

Government Grades. In many markets, eggs may be purchased by government grades. Eggs that are officially graded according to U.S. standards carry a label that tells the quality (or grade), the size based on weight per dozen, and the date of grading. There are four retail or consumer grades for shell eggs, as follows: AA, A, B, and C. Eggs graded AA or A should have a large amount of firm white and a round upstanding yolk. A is the best grade commonly sold. Such eggs are ideal for cooking "as eggs," that is, in the shell, by poaching, frying, etc. These eggs are excellent also for egg drinks and for use in fluffy omelets, soufflés, sponge cakes, and angel food.

Grade B eggs are usually an economical buy. They are satisfactory for general cooking and baking and for combining with many foods. They may be used also in plain omelets and scrambled eggs.

Grade C eggs are rarely on the market. This grade may be used when egg flavor is not important.

Dirty and cracked eggs are always low-quality eggs, and are put into lower grades. Unbroken ones may be graded as "Stained" or "Dirty." Checked or cracked shells may be graded as "Check" or "Leaker."

Eggs are graded as to size as well as quality. Tentative U.S. weight classes for consumer grades of shell eggs are given in Table XX. Extra-large, large, and medium-sized eggs are the ones commonly found on the market, except in the fall months, when pullet eggs are available in the small class. Retail cartons also carry the date of grading.

TABLE XX · *Tentative Weight Classes for Consumer Grades for Shell Eggs*

Size Label	Net Minimum Weight per Dozen
	Ounces
Jumbo	28
Extra large . .	26
Large	24
Medium	21
Small	18

Grade-label information is a guide to other cooking qualities. When high-quality eggs are removed from the shell the eggs are compact, while low-quality eggs spread over a wide area. The yolk of a high-quality egg is upstanding and that of a low quality, very flat and easily broken. The high-quality egg has a large amount of thick white and a small amount of thin white, but the reverse is true of the lower-grade eggs; they have more thin than thick white.

Other Buying Guides. It is easily seen from Table XX that a dozen eggs is not always just a dozen eggs. When it is not possible to purchase eggs by the U.S. grade label indicating the size designation, they should be purchased by weight, that is, by the pound rather than by the dozen. Some producers, wholesalers, and retail dealers use brand names to designate the quality of their eggs. Branded eggs should carry the grade designations.

It is helpful to the consumer to have the date of grading on the carton. It is best to purchase shell eggs from dealers who keep them under refrigeration, since this prevents their deterioration.

The final test of the egg is its flavor and food value. While it is impossible to apply these tests in grading eggs, or at the market when buying them, palatability tests are used as a check of grades and to show the influence of production practices, conditions of storage, and methods of preservation on quality.

Other Market Eggs. Eggs other than fresh eggs are available on the market. Various methods are used for preserving eggs. No medium has been found more satisfactory for preserving shell eggs than cold air. For eggs out of the shell, both freezing and drying are very satisfactory.

COLD-STORAGE EGGS. During periods of high production a large supply of eggs is placed in cold storage to be used during seasons of low production. Production is seasonal, nearly one half of the total supply in the United States being produced during March, April, May, and June. The seasonal variation, however, is not so great as it was formerly. Through better breeding and management practices, production has been extended throughout the year. Only about four per cent of the total production now goes into storage in the shell. When eggs are taken out of storage, graded, and labeled, they appear on the market without any indication of source, except in a few states that require the word "Storage" on the label. For all practical purposes they can be used in the same manner as fresh eggs. Their flavor is usually good. Storage eggs are better than poorly handled "fresh" eggs. The nutritive value of storage eggs is comparable to that of fresh ones.

FROZEN EGGS. About four per cent of the total production of eggs now goes into frozen storage. Frozen storage for eggs out of the shell is economical. Space is saved and spoilage eliminated so long as the eggs are kept frozen. Such eggs are desirable for use in bakery, hotel, and restaurant kitchens. They will become available for home use as facilities for storing frozen foods increase in the retail market and in the home.

Frozen eggs, like other frozen foods, must be kept frozen until needed for use. One of the best methods of defrosting is to

Reading the Label • The wise consumer checks the date of grading, as well as the grade and size. She buys from dealers who keep eggs under refrigeration

U.S.D.A.

place the can of frozen eggs in a pan of running tap water. When defrosted they should be used at once and not refrozen. One pound of frozen eggs is equivalent to about ten medium-sized fresh eggs.

Dried Eggs. When consumers become better acquainted with uses for dried eggs and find them readily available on the market at a suitable price, these products will no doubt win the place they deserve in many kitchens—in the home as well as for large-quantity use. They are economical, convenient, easy to store, and easy to measure and use in cookery. Dried whole eggs, egg yolks, and egg whites are available with virtually the same nutritive value as shell eggs. There may be losses in the less stable vitamins, but dried eggs retain the protein and mineral values of the original shell eggs. The volume of eggs being dried is about the same as that being placed in either cold storage or frozen storage.

Dried whole eggs may be used in most recipes that call for eggs. Two tablespoons of dried whole egg plus two and one-half tablespoons of water are equivalent to one medium-size shell egg.

CARE AND HOME STORAGE

Eggs are perishable and they lose quality rapidly if left in a warm place. In a short time they may reach a stage at which they are no longer edible. One of the first steps in deterioration is the evaporation of water from the white through the shell. This is indicated by the enlargement of the air cell, which in candling is used as one measure of lowered quality. Other indications are the flattening of the yolk and thinning of the white when the egg is broken onto a plate.

Refrigeration of Eggs. To prevent deterioration, shell eggs should be stored in the refrigerator. It is wise to permit as little time as possible between removing eggs from the store refrigerator and placing them in the home refrigerator. A temperature of approximately 45° F. is best, and it should not go above 55° F. Temperatures below 30° F. should be avoided for shell eggs.

Eggs should be covered before storing to prevent evaporation and the absorption of odors from other foods. They should not be washed until a short time before they are to be used.

Any cracked eggs should be used first. Store egg yolks or whites in jars with tight-fitting covers. Unbroken yolks may be covered with water before storing, to prevent drying.

Frozen eggs are best stored at approximately 0° F. Dried eggs should be stored in covered tin or glass containers and kept under refrigeration, if possible.

Home Preservation. In farm homes, various methods are used for preserving eggs when they are plentiful for use during less productive times. From primitive times, people have packed eggs in ashes, clay, wheat, oats, salt, lime water, and other materials to prevent their spoiling.

In preserving, only very fresh clean eggs with sound shells should be used. One low-quality egg may contaminate the lot. It is best to use infertile eggs not over eight hours old.

The method of home preservation of eggs most generally used is the water-glass (sodium or potassium silicate) method. The preservative solution is made by dissolving one part of the silicate in nine parts of boiling water. Boiling sterilizes the water and, if the silicate is added while the water is hot, it dissolves readily. Cool the solution before adding any eggs.

Use a container of glass, crockery, or wood for storing eggs in water glass. A five-gallon crock or jar will hold approximately 14 dozen eggs. The eggs may be added to the solution from day to day as they are collected. Pack with the small end down and the air space up. There should be at least two inches of the solution above the eggs. When a container is full, the top should be sealed or at least very tightly covered to prevent evaporation and deterioration. Store in a cool place.

Eggs preserved in water glass are entirely wholesome but after several months sometimes develop a strong flavor and are better used in cookery than simply as eggs. Since the silicate seals the pores of the shell, if eggs thus preserved are to be cooked in the shell, the large ends should be pricked with a needle to prevent cracking.

PREPARATION AND COOKERY

Eggs are used extensively in food preparation because of the character of the egg proteins, both those in the white and those in the yolk.

Principles of Cookery. Albumin in the egg white is soluble in cold water, while the egg-yolk proteins are not. The proteins of both the white and the yolk coagulate on heating. This characteristic causes eggs to be useful as a thickening agent and for binding food materials.

The viscosity of egg white is such that air may be beaten into it and the incorporated air used as leavening.

Egg yolk and whole egg also may be used as emulsifying agents. (See page 102.)

Eggs for Thickening and Binding. The coagulation of egg protein causes a thickening when egg is combined with liquid, as in custards; or a binding when egg is mixed with pieces of food, as in croquettes, loaves, and timbales.

The different egg proteins coagulate at different temperatures. Several factors influence the temperature at which this coagulation takes place. When undiluted egg white is heated slowly over hot water it begins to turn cloudy at about 130° to 135° F. It becomes jellylike and opaque at about 145° F. If the heating is continued until the water boils, the coagulum becomes tough and leathery; and with further heating it tends to contract and squeeze out water.

Egg yolk requires a higher temperature for coagulation than the white. It begins to thicken slightly under 150° F. It will no longer run at 158° F. On account of the presence of a large amount of intimately mixed fat, the yolk does not become tough, but first waxy and then mealy.

Combined white and yolk begins to thicken slightly below 150° F. and sets to the consistency of a jelly by 158° to 165° F.

When the egg proteins are diluted with liquid the coagulation point is raised and at boiling the protein separates as flocculent precipitate. Not only dilution but the addition of other materials in solution influences the coagulation temperature of egg proteins. Salt and acid both lower the temperature at which coagulation takes place.

Air in Egg as Leavening. When egg white is beaten a foam is formed, due to the incorporation in the viscous white of many tiny air bubbles. The air thus incorporated provides leavening for meringues, omelets, soufflés, sponge cakes, and other dishes.

Yolks when beaten do not increase in volume as much as whites, and the foam is much finer. When whole eggs are beaten the foam is similar to that of the beaten yolks. The presence of fat in the yolk decreases the foaming power of the proteins of the white.

Several factors affect the volume and stability of foams formed from beating egg white, including the condition or age of the egg, the temperature of the egg white, the rate of beating, and the addition of other materials to the egg white.

The more viscous the egg white—a fresh egg usually has a viscous white—the longer it takes to form a foam. Also, the volume is not so great with high viscosity, but the stability is greater, which is very important.

Egg whites at room temperature foam more rapidly and to a greater volume than those at refrigerator temperature.

A flat hand whip gives a coarse-celled foam, while a rotary beater, either hand or mechanical, gives a fine-celled one of greater stability. This type of beater also saves time and energy.

Salt and acids, in the form of common salt and cream of tartar or lemon juice, stabilize the foam, since these substances cause the proteins in the foam to coagulate slightly and give strength to the foam. Sugar increases the strength of the foam so that less air is lost in mixing.

EGG AS EMULSIFYING AGENT. The protein in egg is useful in forming permanent emulsions of oil in liquids as in mayonnaise. The yolk is more effective than the white, although whole egg may be used. This emulsifying property of the yolk is thought to be due to the presence of a compound protein called "lecithoprotein." For the making of mayonnaise, see page 165.

Methods of Cooking. Eggs may be served in a variety of ways. Eggs as eggs are considered a standard item for the typical American breakfast and may be used in other meals as well.

In the cooking of eggs, there is a development of flavor both from the effect of heat on the egg itself and from the addition of seasonings.

Eggs may be cooked in the shell, soft or hard, poached, fried, broiled, baked, scrambled, or made into omelets. One important rule applies to all methods of cooking eggs: for best results in appearance, palatability, and digestibility, **always cook eggs at low to moderate temperatures.** Fast high-temperature cooking of eggs or of egg dishes results in tough, leathery, unevenly cooked products.

EGGS IN THE SHELL. Cooking eggs in the shell is the simplest method of preparing them. For this method, the eggs may be started in cold water or in boiling water.

For a cold-water start: Place the eggs in a pan and add enough cold water to cover the eggs by one-fourth inch. Set the pan over the heat. Bring the water to the boiling point and turn off the heat.

For soft-cooked, let the eggs remain in the hot water from two to four minutes, depending upon the size and the softness desired. Set the pan aside at once if necessary to stop the boiling. When done, cool the eggs in running cold water, just enough so that they may be opened at once.

For hard-cooked, bring the water to the boiling point, turn off the heat, and cover the pan. Let the eggs remain in the hot water *15 minutes.* Cool immediately under running cold water.

For a boiling-water start: Place the eggs in a pan and add enough boiling water to cover the eggs by one-fourth inch.

For soft-cooked, cover the pan and let the eggs stand in the hot water for six to eight minutes. Cool slightly and open the eggs at once. Soft-cooked eggs may be served in or out of the shell, but they should be opened immediately to prevent further cooking.

For hard-cooked, after the eggs are covered with boiling water, cover the pan and heat at simmering temperature for 15 to 20 minutes. Allow two to four minutes longer for extra-large or very cold eggs.[1] A double-boiler may be used to insure a simmering temperature. Cool immediately in running cold water. The shells of hard-cooked eggs

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[1] It is sometimes well to allow eggs to stand out of the refrigerator long enough for them to lose their refrigerator chill.

Table XXI · *Time for Cooking Eggs in the Shell*

Method[1]	Soft-cooked	Hard-cooked
Cold-Water Start Place eggs in pan; cover with cold water; heat to boiling; turn off heat.	2 to 4 minutes; open at once.	Cover pan; 15 minutes; cool in running water.
Boiling-Water Start Place eggs in pan; cover with boiling water; cover pan.	6 to 8 minutes; open at once.	Simmer 15 to 20 minutes[2]; cool in running cold water.

may be cracked by tapping with a spoon. To loosen the shell, roll the egg between the hands, then peel, beginning at the large end, holding the egg under running water to ease off the shell.

The cold-water start may be more convenient and may save time in some cases, but the boiling-water start is more definite. In the cold-water start, the amount of cooking will vary with the temperature of the water at the start and also with the rate of heating. It is well to test both methods carefully and standardize the procedure preferred and the consistency desired.

Exact times for soft-cooked or hard-cooked eggs, by either method, will vary according to individual tastes, the size of the eggs, and their temperature at the time cooking was begun. Table XXI gives approximate cooking times for both soft- and hard-cooked eggs, with both a cold- and a boiling-water start. Cooling hard-cooked eggs quickly in running cold water tends to prevent the surface of the yolks from turning green and also prevents the shell membrane from sticking to the egg white.

There are commercial egg-cookers available, especially for use in the restaurant and hotel kitchens where eggs must be cooked to order. Regardless of the equipment used, eggs cooked in the shell should be cooked at the simmering temperature, never boiling, for tenderness and uniformity of consistency. Overcooking, too, is to be avoided, whether for soft- or hard-cooked eggs.

Poached Eggs. One of the simplest methods of cooking eggs out of the shell is by poaching. To poach eggs, use a shallow pan with enough water to cover the eggs. Heat the water to boiling; then reduce the heat to hold the temperature of the water at simmering, just below boiling. Break each egg into a cup and slip gently but quickly from the cup into the water. The heat may be turned off unless several cold eggs are put into the water.

The addition of salt to the water before putting in the egg hastens somewhat the coagulation of the egg and helps to keep it from spreading too much. There are egg rings available for keeping eggs in a regular shape during poaching, but high-quality eggs will not spread to any extent if carefully handled.

It requires three to five minutes to poach eggs at the simmering temperature. For practical purposes, however, the consistency is judged by the appearance of the egg and by the resistance of the yolk when the tines of a fork are pressed gently against it.

Remove the eggs with a turner, drain and serve immediately on warmed plates.

Fried Eggs. Frying is probably the most universally liked method of cooking eggs, since in frying there is development of flavor. As ordinarily carried out, however, flavor is developed at the expense of tenderness. When the temperature is too high the edge of the white becomes tough, leathery, and

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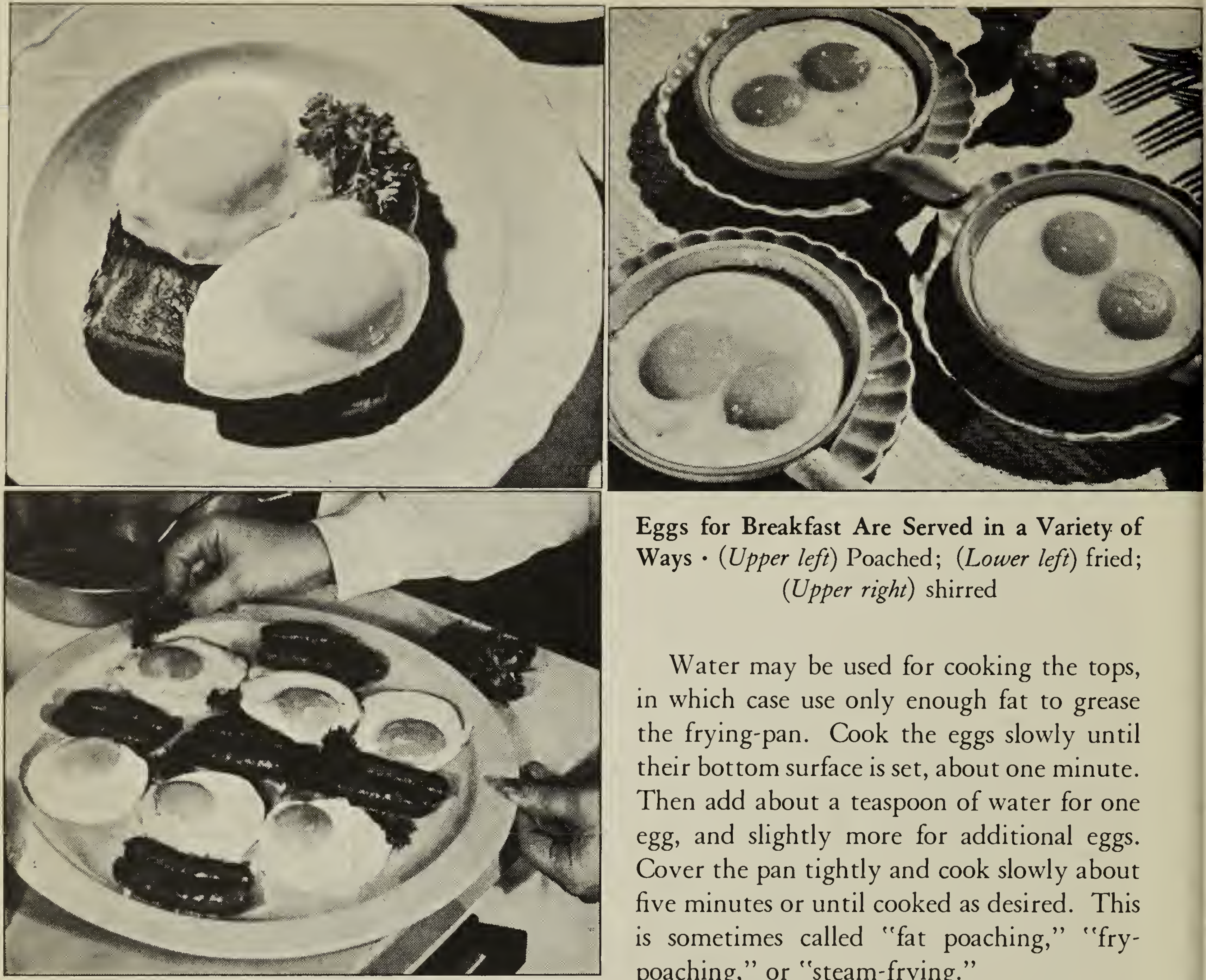
[1] In all cases, the cooking is done below the boiling point.

[2] Use double boiler.



Eggs for Breakfast Are Served in a Variety of Ways · (*Upper left*) Poached; (*Lower left*) fried; (*Upper right*) shirred

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hard to digest. This need not happen if the following method is used.

Heat a thin layer of fat—bacon drippings are good—moderately hot in a frying-pan. The fat should be just hot enough to make a drop of water sizzle. It should **never** smoke. Break the eggs one at a time into a cup and slip each gently into the fat. Cook slowly. The top of the eggs may be cooked gently by basting with the fat in the pan (sometimes called "basted eggs") or the pan may be covered tightly to cook the tops. Still another method is to turn the egg over with a turner. In any case, cook slowly over low heat to the desired degree; only three or four minutes will be needed. Season as desired and serve at once.

Water may be used for cooking the tops, in which case use only enough fat to grease the frying-pan. Cook the eggs slowly until their bottom surface is set, about one minute. Then add about a teaspoon of water for one egg, and slightly more for additional eggs. Cover the pan tightly and cook slowly about five minutes or until cooked as desired. This is sometimes called "fat poaching," "fry-poaching," or "steam-frying."

SHIRRED OR BAKED EGGS. Baking eggs at a low temperature is an easy way to prepare them for a large group. Also, it is a good method to use if the oven is needed for other things. To prepare shirred or baked eggs, bake them out of the shell in greased shallow baking dishes, at 300° to 350° F., from 12 to 20 minutes, seasoning as desired.

There are many variations of shirred eggs. The baking dishes may be lined with buttered crumbs or cheese, sliced or grated. Another variation is to separate the egg whites and yolks, taking care not to break the yolks. Beat the salted whites until stiff and make nests of the whites in buttered baking dishes. Slip unbroken yolks into the hollows in the stiffly beaten whites, and bake. Serve shirred eggs in the baking dishes in which they are cooked.

Scrambled Eggs. There are a number of ways of preparing scrambled eggs. In all methods, the eggs are salted,—about $\frac{1}{8}$ teaspoon salt to each egg; liquid is added, 1 to 2 tablespoons to each egg, and the eggs are beaten.

The liquid may be water, milk, cream, or tomato juice, milk being the most commonly used.

The beating may be done with a fork and should be continued only long enough to break up the whites and yolks, leaving streaks of white and yellow in the cooked product. This style is sometimes called "scrambled eggs, country style." Another style is to beat the eggs with a mechanical beater until they are light and fluffy.

After beating by either method and mixing the liquid and the seasonings with the eggs, pour the mixture into a frying pan containing a little hot fat,—about 1 teaspoon to each egg,—reduce the heat, and cook the eggs slowly. Lift the thickened portions, letting the uncooked part run to the bottom. Avoid constant stirring. Some stirring, however, is the only difference in the preparation of one style of scrambled eggs and that of French omelet. Cook until the mixture sets but is not too dry. Serve at once on warm plates.

Another variation of scrambled eggs is to cook them in a double boiler. In this case usually they are not stirred. With this method, to prevent too high a temperature, the water in the lower vessel of the double boiler should not touch the upper vessel, or else the water in the lower part should not boil. There is less development of flavor than when the mixture is browned in a frying pan, but the product is very tender and fluffy. This style is sometimes called "creamy eggs."

Typical Egg Dishes. There are a number of dishes in which egg is the main ingredient. Typical of this group are omelets, soufflés, and whips.

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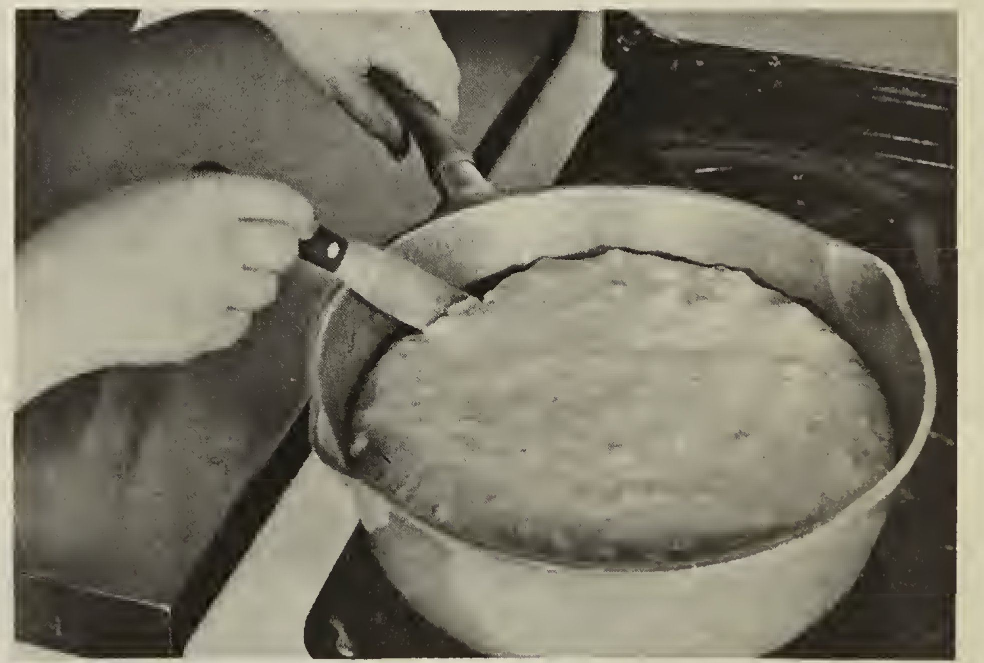

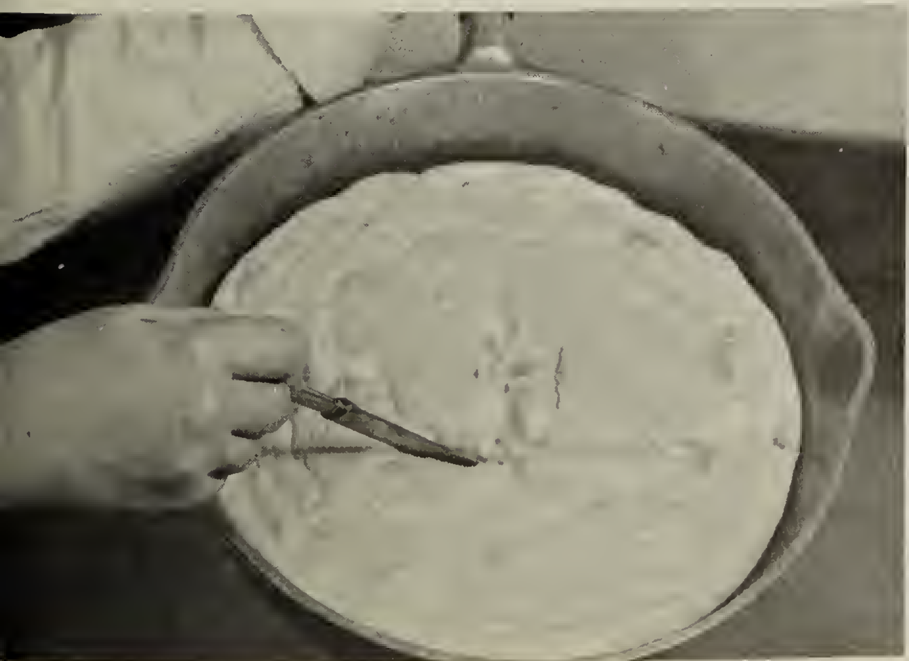

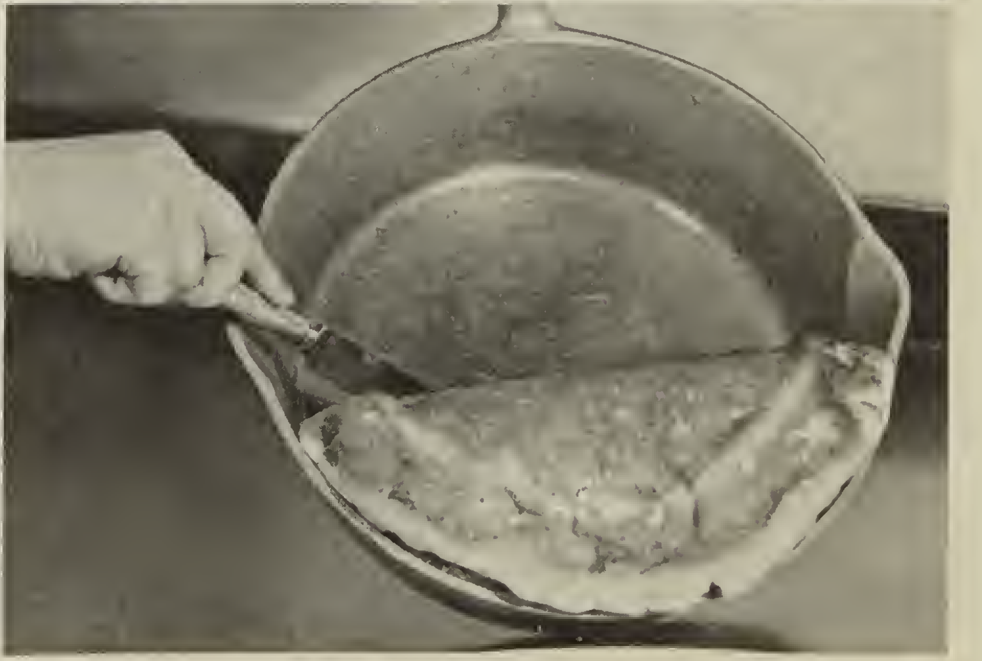

Steps in Making Fluffy Omelet · (*Upper right*) Test sides for browning; then place in oven or broiler a moment, to dry the top. (*Lower left*) Before being folded the omelet is cut almost to bottom in two places slightly off center; so one side folds over the other. (*Lower right*) Turn carefully onto a warm serving platter with the smaller side up

French Omelet. In a French omelet the eggs, without separating the whites from the yolks, are beaten as for scrambled eggs. The same amounts of liquid and seasonings are used as for scrambled eggs. The omelet is cooked in a frying pan but is not stirred. The heat should be kept low so that the omelet will cook slowly. Lift the cooked portions carefully with a fork so that the uncooked part will flow to the bottom. Avoid stirring, and keep the pan as level as possible. Cook until the mixture will no longer flow and the bottom is slightly browned. While the top is still moist the pan may be run into a moderate oven or broiler for a very few minutes to finish cooking the top and brown slightly, if desired.

Roll or fold omelets, depending upon their thickness, using two forks or a spatula, and turn onto a warm plate or platter.

Omelets may be spread with a filling before they are folded or rolled. This may consist of meat, fish, cheese, vegetables, herbs, fruit, jelly, or preserves. Savory sauces may be used as fillings, the sauce being poured over and around the omelet on the platter, or served in a sauceboat alongside. Spanish or creole sauce, made with tomatoes, sliced onions, and green peppers, is a favorite.

Other ways of varying omelets are by the use of additions to the uncooked mixture, such as chopped herbs, bacon, ham, or bread crumbs.

Fluffy Omelet. In a fluffy or foamy omelet the air incorporated in the egg white serves as the leavening. This omelet is prepared by beating the whites and yolks separately. The liquid, if used (a maximum of two tablespoons to each egg), and the seasonings (other than salt) are beaten into the yolks. The whites, with the salt, are beaten stiff and folded into the yolk mixture. The fluffy omelet is cooked in the same way as a French omelet. After it has set throughout and browned on the bottom, it may be placed in a moderate oven or in a broiler to dry the top. It should be folded, not rolled, and served at once on a hot plate.

Any of the additions or variations of the French omelet may be used for a fluffy omelet.

Cream-Sauce Omelets. There is a limit to the amount of liquid which may be added to an egg in making an omelet. If the milk is thickened and made into a cream sauce (see page 63) it is possible to increase the proportion of liquid to egg. While 2 tablespoons of unthickened liquid to an egg is maximum, from $\frac{1}{4}$ to $\frac{1}{3}$ cup cream sauce may be used to each egg. Such omelets are more tender and

Making Prune Soufflé · (*Left*) The thick fruit pulp is folded carefully into the well-beaten whites; (*Right*) bake in slow oven until knife inserted comes out clean

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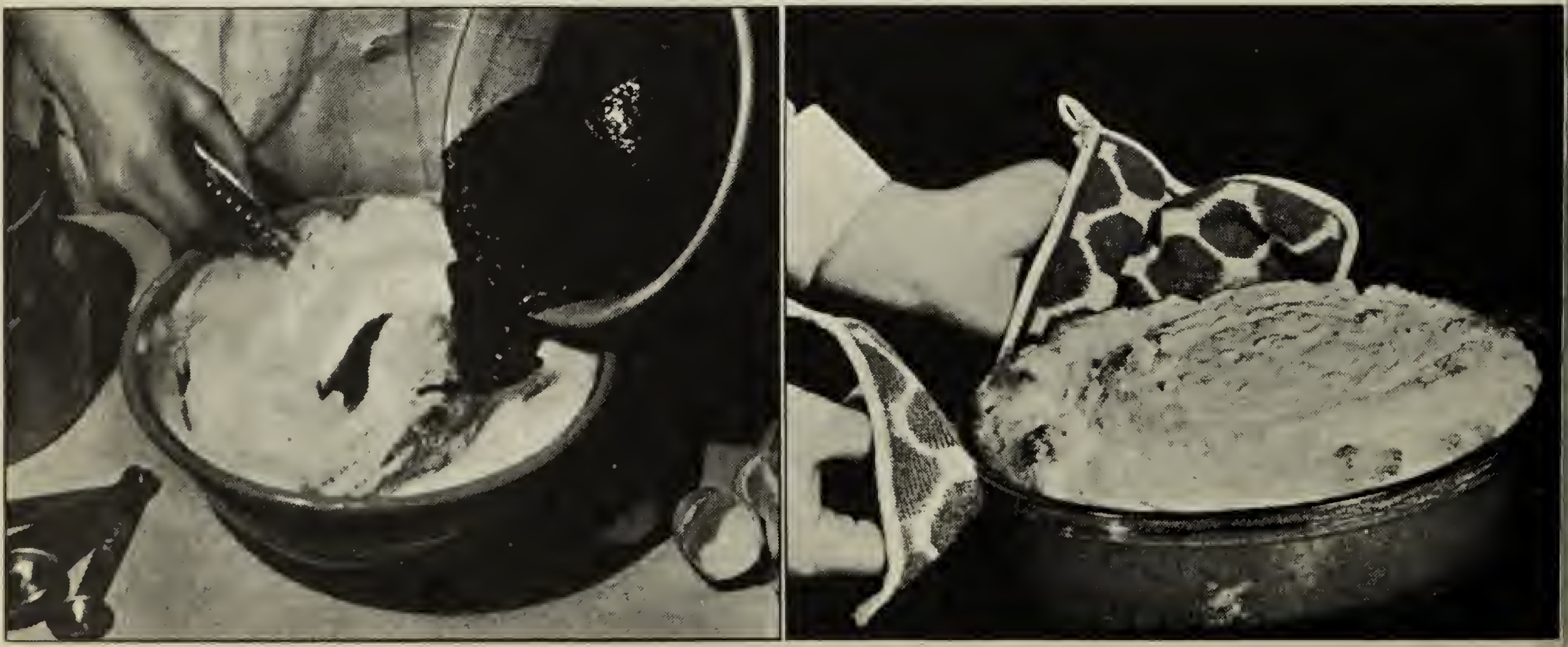


less expensive; and fluffy ones are more successfully prepared when a cream sauce is used rather than unthickened liquid.

Such omelets are prepared in the same way as any fluffy omelet. The thoroughly cooked and slightly cooled cream sauce and seasonings are added to the yolks, and the stiffly beaten whites are folded in last. This type of omelet may be cooked in the oven rather than on top of the range, if desired. When baked, use an oven temperature of 300° to 325° F. for one hour or longer depending upon the size of the omelet.

Soufflés. A soufflé is a baked cream-sauce omelet. A thick cream sauce is used (at least 3 tablespoons flour to 1 cup liquid) and 1 cup sauce to 3 or 4 eggs. The flavoring materials are added to the cream sauce and yolk mixture. The additions most often used for main-dish soufflés are cheese, vegetable pulp, ground meats, or flaked fish. For dessert soufflés, chocolate or fruit pulp are favorites.

Dessert Soufflés and Whips. Dessert soufflés are made in the same way as main-dish soufflés—melted chocolate is added to the hot cream-sauce yolk mixture, and the hot sieved fruit to the well-beaten yolks. Part of the sugar may be added to the yolk mixture or all of it may be beaten into the whites.

If the fruit pulp is thick, the egg whites may be added to it without the use of yolks. When so prepared, such dishes are usually called fruit whips. These can be made of any fruit pulp of pronounced flavor and color. Prune and dried apricot are favorites. The fruit pulp may be heated to dissolve the added sugar and combined while hot with the stiffly beaten egg whites so as partly to cook the eggs and give body to the mixture. A whip thus prepared may be chilled and served, or it may be baked. If to be cooked, place the baking dish of whip in a pan of water in a 250° F. oven. Bake until a knife inserted into the whip comes out clean.

Sauces of various sorts are often used with soufflés and whips. The egg yolks are sometimes used in a custard sauce for the whip.

SPONGE CAKES

Sponge cakes well may be considered along with egg cookery, since the high proportion of egg which they contain is responsible for their character. They are in reality a development from omelets and soufflés.

Sponge cakes differ from the large group of cakes containing fat, sometimes called "butter cakes," in that they contain no added fat, except that contributed by the yolks, and have a sufficiently large amount of egg for the enclosed air to leaven them. This high proportion of egg is responsible for the texture of this group of cakes and the method of combining and baking them. These cakes should be very light and spongy; hence their name.

Kinds of Sponge Cakes. This group of cakes may be divided into three subgroups on the basis of the portion of the egg used. In sponge cakes proper, the whole egg is used; in angel-food cakes, only the white; while in sunshine cakes, the whole egg is used with a larger proportion of white than yolk. In a typical member of this group of cakes no baking powder is used.

Basic Proportions. Basic proportions for sponge cakes are quite simple: approximately equal measures of flour, sugar, and eggs; or, 1 part flour to 2 parts each, by weight, of sugar and eggs. Table XXII gives basic proportions for sponge, angel-food, and sunshine cakes. In sunshine and angel-food cakes, the sugar is frequently increased over the other ingredients. Increasing the sugar increases the tenderness of the cake.

Acid is added to this group of cakes to make them more tender, since acid lowers the coagulation temperature of the mixture. If too much acid is used, the cake becomes

TABLE XXII · *Basic Proportions for Sponge Cakes*

Ingredients	Sponge Cake	Sunshine Cake	Angel Food
Cake flour, sifted . . .	1 cup	1 cup	1 cup
Granulated sugar, fine .	1 cup	1 to 1¼ cups	1 to 1½ cups
Eggs, fresh	1 cup (4 to 6 medium)	1 cup (3 yolks, 6 whites)	1 to 1¼ cups whites (8 to 10 medium)
Salt	¼ teaspoon	¼ teaspoon	¼ teaspoon
Acid	1 tablespoon lemon juice	1 tablespoon lemon juice	1 teaspoon cream of tartar
Flavoring	Grated rind of ½ lemon	Grated rind of ½ lemon	½ to 1 teaspoon extract
Water	2 to 3 tablespoons, hot	0 to 1 tablespoon	

too tender, tends to shrink and fall, and shows an excess of moisture in the crumb.

Since the flavor of lemon is liked in the yellow sponge cakes, lemon juice is the acid frequently used. Lemon juice serves a triple purpose: (1) acts as acid, (2) gives a desirable flavor, and (3) furnishes necessary liquid for the concentrated egg yolk.

Since the amount of water in egg varies, it may be necessary to vary the amount of water used in sponge cakes. It will be helpful to study the appearance of batters and the results obtained, thus learning what constitutes a good sponge-cake batter. When too much liquid is used the cake batter is too thin and separates into layers during baking. (Another reason for layering is failure to bake the batter promptly after mixing.)

Cream of tartar is the acid most used in making angel-food cake. This acid is more accurately measured than lemon juice, and since egg whites contain more moisture than the yolks, the extra liquid is not essential. A few authorities suggest a small amount of liquid, however. With the mild-flavored egg white, usually a more delicate flavoring than lemon juice is used, though that is a personal matter. Two flavors are especially effective in giving an interesting or delicate subtle fragrance: almond and vanilla make a good combination.

In a sunshine cake either lemon juice or cream of tartar may be used as the acid, or a combination of the two. A small amount of liquid may be added if the batter seems too stiff. The proportion of egg is so high in this group of cakes that very little, if any, additional liquid is needed. The egg, therefore, supplies not only the leavening, but also most of the liquid, and, at the same time, the protein necessary to give rigidity to the cooked cake.

Methods of Mixing. In combining the ingredients for a plain yellow sponge cake, the yolks should be beaten until very thick and light yellow in color. Then half the sifted sugar is beaten gradually into the yolks until the mixture is so stiff it will hold its shape. One of the most common faults in mixing sponge cakes is insufficient beating of the yolks and sugar. A double rotary beater does the job best.

Next the hot water and lemon juice are beaten gradually into the yolk mixture.

The salt, cream of tartar, and remaining sugar are sifted over the egg whites and the whites beaten until they are stiff enough to hold a point when the beater is removed.

The sifted flour and the stiffly beaten whites are folded into the stiff yolk mixture, a little of each (about one sixth) added together at a time. The object here is thoroughly to combine the egg whites with the other ingredients without stirring out the air in the beaten whites. It is the expansion of this air that makes the cake light, but if the whites are not well mixed with the other ingredients, the cake will be coarse and uneven in texture. Turn the batter at once into a floured pan for baking. (Do not grease the pan.)

Another method of combining the ingredients for sponge cake is known as the "sirup method." In this, the sugar and egg white are combined as in the preparation of a cooked icing, the sugar being cooked with half as much water as sugar to a sirup that boils at 238° to 240° F. While hot, this sirup is poured slowly over the stiffly beaten whites, to which the salt has been added during the beating. The yolks are beaten until thick and light-yellow and the lemon juice and hot water added to them. Then the yolk mixture is carefully folded into the sirup–egg-white mixture until the color is even. Lastly, the sifted flour is folded into the egg mixture.

Since sunshine cake contains both parts of the egg, the methods of combining are the same as for plain sponge cake.

In combining the ingredients for angel-food cake, the method must be changed somewhat, since only the whites of the eggs are used. A better cake is obtained when at least a part of the sugar is added to the whites before the flour.

Sift from $\frac{1}{2}$ to $\frac{2}{3}$ of the sugar with the sifted flour to mix well. Then add the salt and cream of tartar to the whites and beat until the mixture is foamy. Gradually beat the remaining sugar into the whites. Add the flavoring and continue beating until the mixture is stiff enough to hold a point when the egg-beater is lifted from it. The sugar-flour mixture is gradually added last, folded into the beaten egg-white mixture. The batter then is ready for the pan. Bake at once.

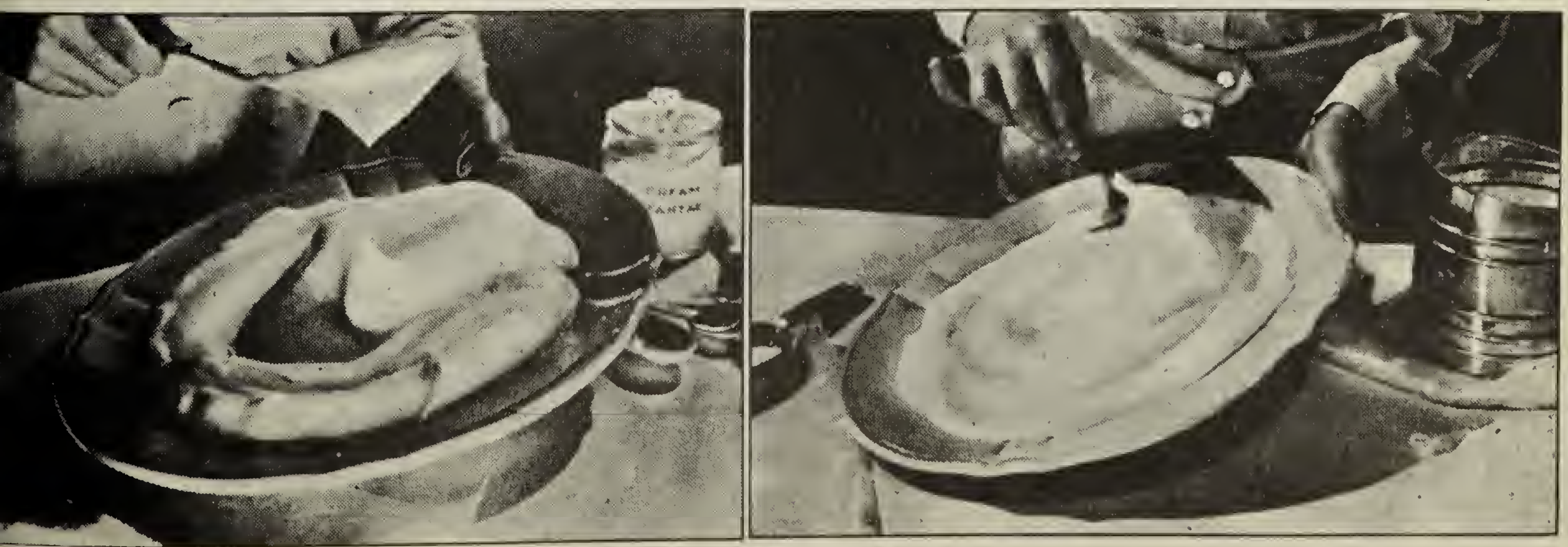
The sirup method also may be used for angel-food cake. The sirup, made by boiling the sugar with half as much water to the proper concentration (238° to 240° F.), is poured over the stiffly beaten whites, while the beating goes on. The flour is folded in last.

The sirup method of making sponge cakes gives a fine-textured cake, but one of less volume than the first method described.

Baking Sponge Cakes. Sponge cakes are usually baked in tube pans. They should be baked at a comparatively low temperature, 325° to 350° F. A temperature of 325° F. is a good standard temperature. These cakes are leavened by air which expands slowly as the temperature of the cake mixture rises. The mixture contains such a large proportion of egg that it coagulates very readily. If the cake is placed in an oven at too high a temperature, the top coagulates and crusts over before the mixture is heated through and the air has been expanded. The effect

Mixing a Sponge Cake · (*Left*) Beat the egg whites until they are stiff enough to hold a point when the beater is removed; (*Right*) the sifted flour and the beaten whites are folded carefully into the stiff yolk mixture

Courtesy General Foods Corporation



of too low a temperature is a dry cake of low volume, with a crumb that is less delicate and desirable than it should be. The "just-right" low temperature makes the sponge cake light and tender, while high temperature toughens it and prevents it from rising to the full extent.

In a tube pan, at the range of temperatures suggested, approximately 40 minutes to one hour is needed for baking. Bake until the cake is delicately browned and springs back when lightly touched with a finger tip. Remove from the oven, and invert the pan so that it stands on the tube. Cool thoroughly and then loosen the cake with a spatula and remove from the pan.

Mock Sponge Cakes. When eggs are difficult to obtain it is possible to make substitutions for part of the egg in sponge cakes. Liquid and baking powder may be substituted for approximately half of the egg, in the proportion of 2 tablespoons water or milk and $\frac{1}{2}$ teaspoon baking powder for each egg omitted. In this case, the cake is not a true sponge cake, because of the use of baking powder. But it has no added fat and is similar in character to sponge cakes. It is light and spongy and in many instances more tender than the cakes of the typical group. Such substitution may be made in any of the sponge cakes.

In combining these cakes, the liquid is mixed with the yolk when the whole egg is used. In angel-food cake, the dry ingredients are sifted together, the liquid is added to them slowly, and beating is continued until the mixture is smooth. The stiffly beaten whites are folded in last. For best results, sift half the sugar with the dry ingredients, using the remaining sugar to make a meringue of the egg whites which is folded in last.

A slightly higher temperature may be used for mock sponge cake than for true sponge cake, 350° F. for 30 minutes, or until the cake springs back when touched with the finger.

CUSTARDS

Custards are another group of egg dishes. The egg serves as a thickening agent. The name "custard" is given to any mixture thickened with egg. The liquid used in making custard is usually milk, though other liquids are sometimes used. The use of starch for thickening has been considered in Chapter IV.

Kinds of Custards. Custards are classified, according to their consistency and method of cooking, as soft custards and baked custards. Soft custards are sometimes miscalled "boiled custards," but a custard never should be boiled. The consistency depends upon the proportion of egg to liquid and the method

Handle Baked Cakes with Care · (*Left*) Let cool in pan; then loosen the cake and remove carefully; (*Right*) in serving never cut a sponge cake but gently separate the slices with two forks

Courtesy General Foods Corporatio

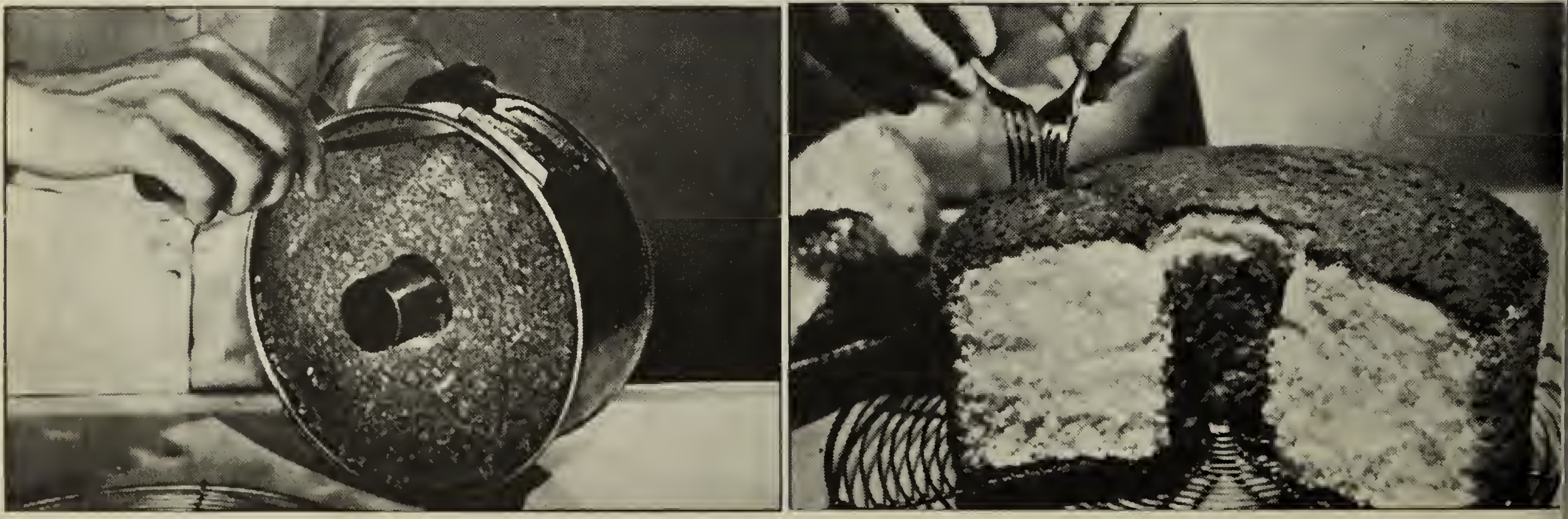


Table XXIII · *Basic Proportions for Custards*

Ingredients and Uses	Soft Custards		Baked Custards
	Thin	*Thick*	
Milk	1 quart	1 quart	1 quart
Eggs	2 to 3 whole *or* 4 to 6 yolks *or* 4 to 6 whites	4 to 6 whole *or* 8 to 12 yolks *or* 8 to 12 whites	4 to 6 whole *or* 8 to 12 yolks *or* 8 to 12 whites
Sugar (may vary)	½ cup	½ cup	0 to ½ cup
Salt	¼ teaspoon	¼ teaspoon	¼ teaspoon
Flavoring, if desired	1 teaspoon vanilla	1 teaspoon vanilla	1 teaspoon vanilla, if desired
Cinnamon or nutmeg, if desired			
Uses	1. Sauces for cakes, fruit, etc. 2. Basis for eggnog, frozen custards, etc.	Serve alone as dessert.	1. Serve alone. 2. Pies 3. Corn pudding

of cooking. Either the yolk, the white, or the whole egg may be used. The yolk gives a smoother consistency, richer flavor, and better color than the white alone.

Basic Proportions. The thickening power of an egg yolk is approximately the same as that of an egg white. The yolk is more concentrated than the white, but the white is larger than the yolk. Two egg yolks have approximately the same thickening power as one whole egg. A cup of yolks, however, should make a thicker custard than a cup of whites.

Soft Custards. Soft custards are made of different consistencies, depending upon their use. When a sauce is desired, one-half of a whole egg or one yolk is minimum thickening for each cup of liquid. For a soft custard to be served alone (a thick custard), twice this amount of egg is needed; a whole egg or its equivalent to each cup of liquid is the minimum.

Baked Custards. When the custard is baked, the same amount of egg to a given amount of milk is needed as in a thick soft custard. The difference in the method of cooking makes the difference in the consistency of these two custards.

Table XXIII gives basic proportions for custards, with uses for each kind.

Methods of Preparing. For any custard, the egg is beaten just enough to break it up. If beaten enough to incorporate air, the egg will float on top and not combine readily with the liquid and thicken it. When sugar is used, as it is in most cases, it is mixed with the slightly beaten egg. This seems to help make a smooth combination of the egg with the hot milk. The salt also is added here.

The milk may be easily heated in a double boiler without becoming too hot. When hot, pour the milk over the egg mixture. Stir until thoroughly mixed.

For a soft custard, return the mixture to the double boiler. Cook over hot water, stirring constantly, until the custard will coat a spoon. Then it should be removed immediately to prevent overcooking. If allowed to cook too long or to reach too high a temperature, the egg protein is overcooked and the custard curdled in appearance. The only remedy for such a custard is hard beating to break up the curds of overcoagulated protein. The best way for preventing this condition is by proper cooking. The custard should never exceed a temperature of 160° F. Both too high a temperature and too long cooking will ruin any custard. The flavoring and spices are added last, even after chilling if the custard is to be served cold.

For a baked custard, the mixture is poured into baking dishes, instead of being returned to the double boiler, for cooking. This kind of custard is cooked without stirring in a slow oven, 300° to 325° F., until an inserted knife comes out clean. It should be removed from the oven as soon as this stage is reached, to prevent overcooking. A properly baked custard has smooth even texture; over-cooked custards tend to separate.

When baking custard it is a good practice to place the dish of custard in a pan of water in the oven. This equalizes the temperature. It also serves as a guide to oven temperature when needed. The water surrounding either kind of custard during cooking never should boil.

Since a baked custard is not stirred, the flavorings and seasonings necessarily are added before cooking. This kind of custard retains the solid jellied consistency which distinguishes it from the soft custards.

Variations in Flavor. Much variety in custards may be derived from the flavoring. Any of the extracts or a combination of them, such as vanilla and almond, may be used. A part of the sugar may be caramelized or caramel may be prepared in advance. Brown sugar may be used for special flavor, as well as to give sweetness. Chocolate may be added. This may be melted and cooked in the milk. When chocolate is used, the sugar may need to be increased.

Cinnamon or nutmeg or both may be added to custards of all kinds.

Corn and other vegetables may be baked in custards. The well-known corn pudding is simply a baked custard. The liquid from the canned corn may replace part of the milk and the corn itself is cooked in the custard.

French Custards. When eggs are scarce, or from choice, cornstarch or flour may be substituted for as much as half of the egg in either soft or baked custards. Enough whole egg or egg yolk must be used, however, to give the characteristic color and flavor of a true custard. The starch or flour is added to the milk and this mixture is brought to a hard boil, with constant stirring. It should be cooled to approximately 160° F. before the slightly beaten egg and sugar are added. The cooking is completed in the same way as for a true custard, that is, at low temperature.

To make up for the lack of richness when egg yolk is decreased, butter or margarine usually is added to a French custard. In a cheap custard this may be omitted. The following recipe gives basic proportions for a thin French custard: 2 tablespoons butter or margarine, 2 tablespoons flour or one of cornstarch, 4 cups milk, $\frac{1}{2}$ cup sugar, $\frac{1}{4}$ teaspoon salt, 4 yolks or 2 whole eggs slightly beaten, 1 teaspoon vanilla, and a dash of cinnamon or nutmeg, if desired.

OTHER USES OF EGGS

There are many other uses for eggs in food preparation than those discussed in this chapter. The use of egg as an emulsifying agent is considered in the chapter on "Salads and Salad Dressing." The use of egg in flour mixtures is discussed in the chapter on "Batters and Doughs." Egg as a binding material is considered in connection with the frying of croquettes on page 146. Eggs in pie fillings and as an essential ingredient for meringues are discussed in the chapter on "Pies and Other Pastries."

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VIII · Milk and Milk Cookery

Milk is the food which mammals produce to feed their young during the period immediately after birth, when growth is most rapid. It must supply body-building materials combined with sufficient energy-yielding nutrients to keep the young animals warm and furnish the energy for their activity. A study of the composition of milk of different species (see Table XXIV) shows a close relationship between the time required for the young animal to double in weight and the amount of tissue-forming foods found in milk. The following discussion is limited to cow's milk.

PHYSICAL FORM

In the fresh state milk is a yellowish-white opaque liquid. If allowed to stand, it separates into two layers. The upper layer, or cream, contains the milk fat. The fat-soluble vitamins are in this portion. The heavier layer contains the proteins, milk sugar, minerals, and the water-soluble vitamins. This portion is white or bluish-white in color. When separated from the cream it is known as skim milk. Skim milk contains in solution the nonfat milk solids.

Milk is heavier than water. Its specific gravity varies from 1.027 to 1.040. Cream, because of the high fat content, has a lower specific gravity than whole milk; so it rises to the top and can be removed by skimming.

Fat is present in milk in the form of small globules, each surrounded by a film of protein. This film prevents the globules from coalescing, and keeps them in suspension. Fat distributed in a liquid in this way is said to be in the form of an emulsion. Under the microscope these small droplets of fat can be seen. In cream they are much closer together than in whole milk. In skim milk only occasional fat globules appear. The fat in milk from Holstein cows is distributed in smaller globules than that in Jersey milk. The size of the globules in the milk from the other breeds varies between these two extremes. Holstein milk is recommended for infant feeding since the small fat globules are easier to digest.

The pigment which gives the color to cream and butter is soluble in the fat. The amount present varies both with the breed of cow and with the amount of green food which the animal consumes.

TABLE XXIV · *Time Required for Young Animals to Double Weight and Amount of Tissue-forming Foods in the Mother's Milk*

ANIMAL	TIME REQUIRED TO DOUBLE WEIGHT	COMPOSITION OF MILK			
		Protein	Total Ash	Calcium	P_2O_5
	Days	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Human	180.0	1.4	0.2	0.0328	0.0473
Cow	47.0	3.4	.7	.1600	.1970
Goat	19.0	3.3	.7	.2100	.3220
Sheep	10.0	5.5	.9	.2720	.4120
Cat	9.5	7.0	1.0		
Dog	8.0	7.3	1.3	.4350	.4930

Homogenization. When the fat globules in the cream layer of milk are too large, they tend to run together and separate as an oily layer. This separation can be prevented by homogenizing the milk. In this process the milk or cream is forced through small pores in a diaphragm under very high pressure at a temperature of 167° F. This breaks up the fat into very small globules of uniform size and distributes them in the solution of milk proteins. These proteins coat each drop of fat, forming a stable emulsion. When the globules are very small, they tend to remain uniformly distributed through the milk so that the cream does not rise on homogenized milk.

It is possible, by homogenization, to redistribute butter in skim milk to form either whole milk or cream. Since butter keeps much better than cream, milk fat is sometimes stored in this form and redistributed in milk later when a supply of cream is needed to meet an unusual demand.

Market Forms. On the consumer market, cream and whole milk are available in fresh fluid form, in bottles or paper containers. Either may be obtained homogenized. Buttermilk and skim milk also are available in fresh fluid form. Condensed and evaporated milk are available in cans. Dried whole milk, dried skim milk, and dried buttermilk are available to wholesale consumers, and in some markets are available through retail channels.

COMPOSITION AND NUTRITIVE VALUE

Composition. Milk contains more of the nutrients known to be essential to health than any other food. It is especially useful as a source of calcium, riboflavin, and efficient protein. While the composition of milk from different herds varies, its average proximate composition is as shown in the table.

Composition of Milk		
Water	87	per cent
Protein	3.3	per cent
Fat	4	per cent
Carbohydrate . . .	5	per cent
Minerals	.7	per cent

The most variable constituents in milks from different sources are the protein and the fat. The protein varies from three to four per cent, and the fat from three to six per cent. The carbohydrate content is relatively constant (about five per cent) and the mineral content ranges from .7 to .75 per cent.

Fat is the constituent of milk to which the greatest commercial importance has been attached. Since this is also the portion which is most variable, milk is sold to the creamery on the basis of its fat content. The commercial importance attached to fat, as compared with the other constituents of the milk, is not supported by the contribution of this portion to nutrition. The commercial emphasis on butterfat is probably due in part to the fact that butter and cream are less bulky, and can be stored and shipped more easily than whole fluid milk, and in part to consumer demand for butter and cream.

Chemically, the fat in milk is a mixture of fats of different melting points. Palmitin, olein, and stearin predominate (see page 137). The characteristic flavor of the butterfat is contributed by the four per cent of butyrin and certain other volatile fats which it contains. The name *butter* is derived from *butyrin*.

Protein. The protein in milk is largely in the form of casein, a compound of protein with a phosphorus-containing group. Under the conditions normally present in milk, casein does not coagulate on heating like the albumin in egg white. It is precipitated by weak acids formed in the souring of milk, and is clotted by the enzyme rennet, normally present in the gastric juice.

There are three other proteins in milk—

lact-albumin, lact-globulin, and fibrinogen. All are present in small amounts. There are also some extractive materials containing nitrogen. The extractives are most abundant at the beginning of the period of lactation and seem associated with the needs of the young animal at that time.

CARBOHYDRATE. The carbohydrate in milk is lactose. It is a disaccharide of the formula $C_{12}H_{22}O_{11}$ and yields glucose and galactose upon hydrolysis. Milk is the only food in which lactose is found. It apparently is manufactured in the mammary gland from the circulating sugars brought to it.

When milk is heated to high temperature, the lactose is partly caramelized, and a brown color and characteristic taste are imparted to the milk due to a reaction between the lactose and the protein in the milk. This gives its characteristic taste to evaporated milk.

MINERALS. Calcium and phosphorus are the minerals most abundant in milk. The iron content is low but is in a readily available form. The low iron content in a food which nature provides for a young animal that will require iron for hemoglobin formation is explained by the fact that all animals are born with a store of iron in the liver. If milk is used as an exclusive food for too long a time, dietary anemia may result.

VITAMINS. Both the fat-soluble and the water-soluble vitamins are present in milk. Whole milk, cream, butter, and cheese made from cream or whole milk are excellent sources of vitamin A. The amount present varies with the amount of green food available to the cow. Since vitamin A is stable to heat, boiled, dried, canned, and pasteurized whole milks and cream still retain a large part of their original content of this vitamin. Butter is an excellent source of vitamin A.

Milk is only a fair source of the B vitamins as a group. It is an excellent source of riboflavin and contains small amounts of thiamine, niacin, and the other B factors. These vitamins are all water-soluble and so are most abundant in the nonfat portion of the milk. Dried skim milk is one of the cheapest food sources of riboflavin. Small and variable amounts of vitamin C are present in raw milk. This vitamin is very unstable, so that heated milk contains little or none.

Milk fat may contain a small quantity of vitamin D. The amount varies with the season and the extent to which the cows are exposed to the sunlight, while irradiated milk is available which contains vitamin D.

Variations in Composition. A number of factors influence the composition of milk. Use is made of these factors in the management of herds to obtain milk of the general composition desired. The amount of fat is characteristic of the breed. Jersey cows give milk with the highest percentage of fat (an average of 5 per cent), while the average for Holstein milk is 3.5 per cent. Between these extremes range the Guernsey, the Ayrshire, and the Dutch Belt, in descending order. Individual animals and families within breeds have certain tendencies in milk production which are transmitted by inheritance. These differences are shown in the amount of milk and the amount of fat it contains. Breeding for milk production within the different breeds and by crossbreeding is based on these individual and family differences.

Feeding influences both the quality and the quantity of milk. A well-fed cow gives more milk and a better quality of milk than one that is poorly fed. However, food has more influence upon the quantity than upon the composition of milk. In general, both quantity and composition of milk are more affected by breed than by amounts and kind of feed, but no cow will give the best results in milk production unless properly fed.

Seasonal and daily variations in composition also occur. The milk of well-fed cows is usually richer in winter than in summer owing to the prevalence of more succulent food during the summer months. The morning milk is of greater quantity, and contains less fat than the evening milk.

Frequency of milking affects the quantity of milk obtained but has little effect on composition. If milked three times a day the cow will yield from 10 to 15 per cent more milk than if milked only twice, as is customary. This gain usually is not considered sufficient to offset the increased labor cost of the extra milking.

While these variations can be followed in the individual cow, in the milk from a mixed herd the differences tend to neutralize one another and there is less variation from day to day than in the milk from one cow. The differences in the compositions of milk from different herds are controlled largely by breed, care, and feeding.

Composition Standards. Since there are variations in the composition of fresh milk, and a variety of forms in which milk solids are available on the market, standard definitions for the different milk products have been established by the Food and Drug Administration. These standards are expressed in terms of composition. Substances designated by the names of these milk products entering interstate commerce must conform to these standards. In general, state or local standards are based on these Food and Drug Administration definitions.

Cream may be light, medium, or heavy depending upon the fat content. **Light cream** is sold as table or coffee cream. It must contain not less than 18 per cent fat. **Medium cream** is light whipping cream. It must contain at least 30 per cent fat. **Heavy cream** contains more than 36 per cent fat. Light and medium cream may be homogenized.

Fresh fluid whole milk must contain not less than 3.25 per cent fat and 8.5 per cent of solids not fat. Fresh milk is sold raw or pasteurized and may be homogenized.

Dried whole milk contains all the milk solids. It must have not less than 26 per cent milk fat and not more than 5 per cent moisture.

Skim milk is milk from which most of the fat has been removed. It is rarely available on the market in fluid form, because of the cost of distribution. It is available in dried form as nonfat dried milk solids. Nonfat milk solids must contain not over 5 per cent moisture and not over 1.5 per cent fat.

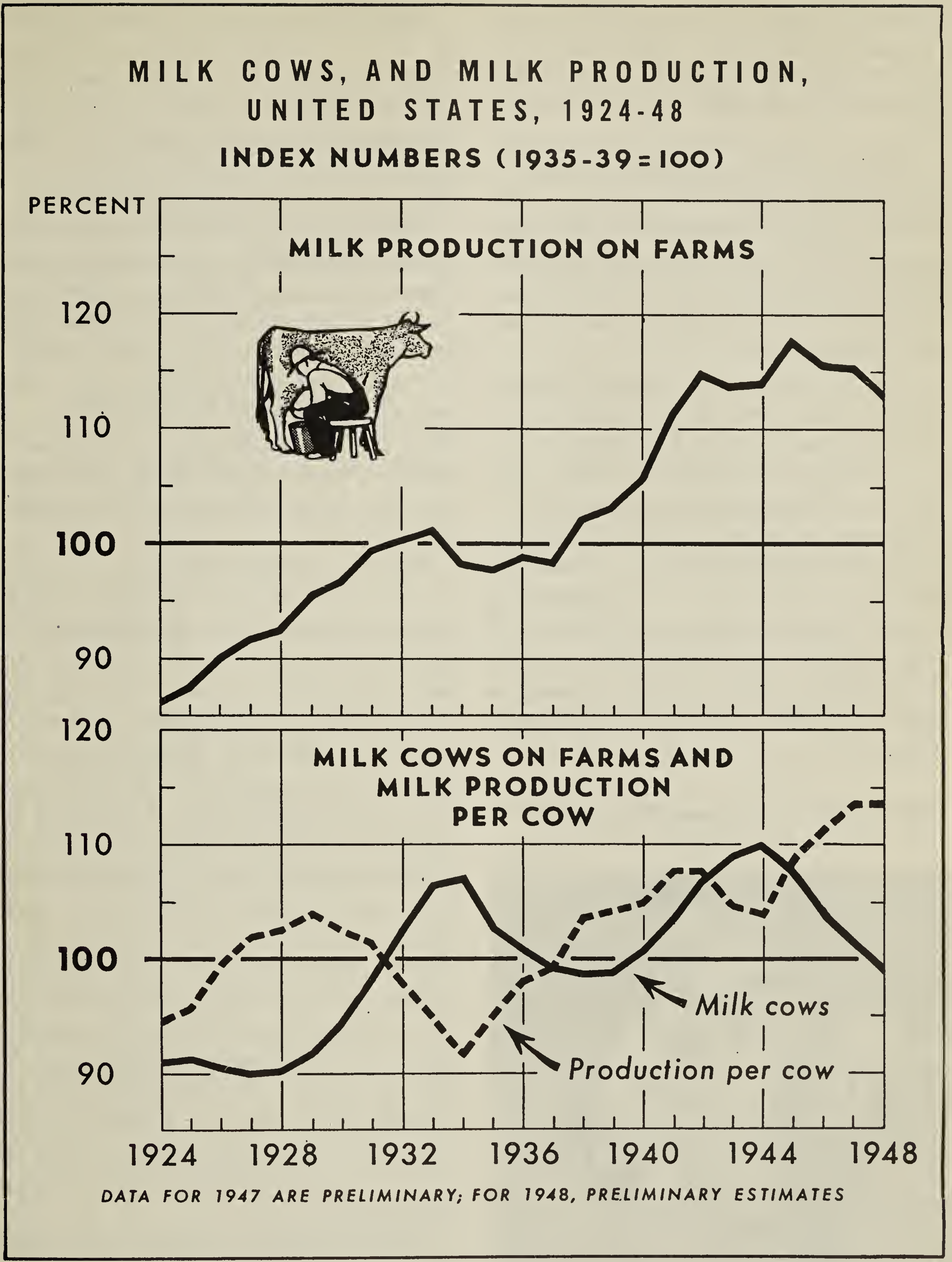
Buttermilk is the product left after the removal of fat from milk by churning either milk or cream, sweet or sour. Except for the acid content, buttermilk is similar in composition to skim milk. It must contain not less than 8.5 per cent of milk solids not fat.

Evaporated milk is a canned milk product prepared by removal of 60 per cent of the water from fluid whole milk. It must contain not less than 7.9 per cent fat and not less than 25.9 per cent total milk solids.

Condensed milk, technically designated "sweetened condensed," is a canned milk product prepared by concentration of a mixture of milk and sugar. It must contain not less than 7.9 per cent milk fat, and not less than 25.9 per cent of milk solids not fat.

Nutritive Value. Milk, in all forms, is an excellent source of calcium, good quality protein and riboflavin, and a good source of vitamin A. It also contains appreciable quantities of other vitamins and minerals. Nearly two thirds of the solids of milk consist of fat and sugar, which are good sources of energy.

Skim or separated milk contains a large proportion of the proteins, minerals, B vitamins, and lactose. Either fluid or dried skim milk is a very useful food. It is lower in caloric or fuel value, less rich in flavor, and a very poor source of vitamin A, as compared with whole milk, but contains all the other nutrients. In the ordinary mixed diet in which fat can be supplied in various other



U.S.D.A.

The Milk Supply Has Been Increased by Improving the Yield per Cow forms, and vitamin A obtained from fat containing vitamin A, green vegetables, or cod-liver oil, skim milk has much to commend it. Skim milk is especially useful in low-cost diets.

Protein, calcium, and riboflavin are the most costly of the nutrients, and are most difficult to supply in adequate amounts when food money is scarce. Skim milk provides protein and calcium in a very cheap and useful form, and is at the same time an excellent source of riboflavin.

Skim milk also has an important role in reducing diets. In these it provides many essential nutrients with low caloric value. Any deficiency in vitamin A is easily made good by butter or fortified margarine and an abundance of yellow or green vegetables, especially the green leafy ones. While skim milk has its own special role in contributing essential protein, calcium, and riboflavin to low-cost and weight-reducing diets, it should be used also in cooking and as a beverage in any diet in which the supply of whole milk is limited.

Milk Is a Favored Beverage with Growing Boys and Girls

U.S.D.A.

Digestibility. Milk is a complex food and its various constituents behave differently during digestion. Because of its fluid form, milk is usually considered a liquid food. However, as soon as it reaches the stomach, the casein of milk is coagulated by the rennet there and the milk forms a semisolid jelly.

There are various theories in regard to the part that the clotting of the milk plays in its digestion. The clotting separates the major portion of the protein from the other constituents which need somewhat different treatment, and prevents this casein from passing into the small intestine before it is ready for intestinal digestion. In some cases, however, the curd may become tough and cause discomfort, and may not be completely digested.

In infant feeding tough curds are to be avoided. The dilution normally required in making up the formula contributes to the formation of a soft curd. Its texture is further improved by the use of cereal gruels, dextro maltose, and corn sirup. These carbohydrates, added to supply the needed calories to the infant's daily diet, seem also to get between the particles of casein and influence the formation of a more tender curd.

Heating milk is another method of making the curd more tender. Milk that has been boiled directly over the heat for three minutes or more, and evaporated milk which has been heated to a high temperature during canning, form tender curds that are handled much like human milk in a baby's stomach. Milk heated in a double boiler and pasteurized milk form curds somewhat softer than those of raw milk, but not so soft as the curds formed by milk heated to higher temperatures.

Milk fat, because of its form, is one of the most easily digested fats. But the proportion of fat to the other constituents in milk is high and some of it may escape digestion and absorption when milk is used as an exclusive food. The fat is well utilized when milk is a component of a mixed diet.

In infant feeding there is usually no difficulty in the digestion of fat, provided the milk is so modified that the amount of fat present is not greater than in average mother's milk. Holstein milk is recommended for infant feeding in preference to Jersey milk, because it has lower fat content, and because the smaller fat globules are more easily digested by infants.

SANITARY CARE OF MILK

Milk furnishes an excellent medium for the growth of bacteria, and the method by which milk is collected offers many opportunities for contamination. The air of the stable, the cow herself, the pails, the hands of the milker all may carry bacteria.

Bacteria in Milk. Many different types of bacteria are found in milk. Some are harmless or useful under controlled conditions; others are harmful under all conditions.

Lactic-acid-forming bacteria are the predominating type. When raw milk is allowed to stand, these bacteria change some of the lactose to lactic acid and the milk curdles, since the acid precipitates the casein. The time required for this change depends upon the number of bacteria present and the temperature at which the milk is held. About one-fourth of the lactose in the milk is used in the formation of this acid.

The presence of lactic acid holds in check the development of certain other types of bacteria. In areas where refrigeration is not available, use is made of natural souring as a means of extending the time during which fluid milk is usable. Koumiss and kephur, forms of fermented milk used in eastern Asia and North Africa, probably had their origin as a means of preservation.

Putrefactive bacteria also are found in nearly all samples of milk. These organisms, if allowed to persist, decompose the proteins in milk and produce disagreeable odors and flavors. The development of these bacteria is retarded by the acid formed when lactic-acid bacteria are present.

Disease-producing bacteria may be present. Diseased cows produce infected milk. Tuberculosis and undulant fever are transmitted in the milk from infected animals. Other sources of disease-producing bacteria are the hands of the milker, and utensils or containers which have been washed with water from a contaminated source. A single organism entering the milk may multiply sufficiently before the milk is used as food to cause infection of the whole supply.

The diseases most frequently transmitted by milk are tuberculosis, undulant fever, typhoid fever, and occasionally diphtheria and scarlet fever. All disease-producing bacteria are destroyed by the pasteurization of the milk. Tuberculosis, and especially undulant fever, are so likely to appear, even in the best herds, that health authorities recommend the pasteurization of all milk to be used for food in any form.

Methods of Control. So many epidemics have been directly traceable to the milk supply that public health and dairy officials have made every effort to safeguard the sanitary character of this important food. Herds are inspected regularly to detect any diseased animals. In addition, every precaution must be taken to prevent contamination during milking. This requires sanitary stables, cleaned before milking, and clean milkers with sanitary clothing and sanitary milk pails. The milk must be cooled as soon as it has been drawn and stored in suitable containers to prevent subsequent contamination. It must be held at a low temperature to retard the development of any bacteria present. By such precautions, "certified raw milk" is produced with a minimum bacterial count at a cost considerably above that of milk produced with reasonably good care.

In view of the fact that individual cows from herds producing certified milk may be found infected during required inspections, public-health officials recommend that reasonable precautions be required in the collection of market milk, and that all supplies be pasteurized before distribution. The wisdom of this recommendation is borne out by the frequent cases of undulant fever in areas where pasteurization is not required.

Heating the milk lowers the bacterial count. Boiling the milk will kill any disease-producing forms of bacteria and decrease markedly the number of the other forms present in milk. Boiling is definite and easily controlled but brings about a decided flavor change in milk which is objectionable to many persons. For this reason pasteurization, in which the heating is done at a lower temperature, is generally used.

Heating milk to controlled temperatures below boiling is called pasteurization. There are two methods: in one, the milk is held at a temperature no lower than 143° F. for not less than 30 minutes; in the other, known as the flash method, the milk is brought to 160° F. and held there for not less than 15 seconds. In both cases the milk is cooled quickly to 50° F. or below. Pasteurization, like boiling, destroys all the disease-producing bacteria and greatly reduces the counts of the other types without having the adverse effect on flavor that boiling has.

Sanitary Grades. As a part of the effort to improve the sanitary quality of milk by the regulation of conditions of production and methods of handling, grades and standards based on sanitary care have been established in most communities where milk flows into commercial channels. These regulations are not uniform from community to community. To encourage uniformity in standards, a model milk ordinance has been drawn up and jointly approved by the U. S. Public Health Service and the Bureau of Dairy Industry of the U. S. Department of Agriculture.[1] These requirements for producing milk of the various sanitary designations and the standards for each are listed below. The sanitary grade of bottled milk is indicated on the bottle cap, and when the milk is distributed in cartons this information is placed on the carton.

Certified milk is raw milk of uniform composition and a fixed and very high standard of purity. It is produced under excellent conditions of sanitation specified by the American Association of Medical Milk Commissions. It must not contain more than 10,000 bacteria per cubic centimeter of milk, and must not be more than 36 hours old when delivered. A local medical commission periodically inspects the cows, milkers, and buildings of dairies that are producing milk of certified quality, analyzes the milk, and issues a label or certificate for each approved dairy to use as long as it continues to meet the standards.

The cost of certified milk is usually about twice that of ordinary good bottled milk. The principal use of certified milk is in special cases of infant and invalid feeding where raw milk of special purity is advised. When milk is to be heated before use, certified milk offers no advantages over Grade A milk. Most health authorities feel that any possible advantage of raw milk is more than offset by the danger in its use.

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[1] *Milk Ordinance and Code*, Public Health Service, Bulletin No. 220 (1939 — reprinted 1946).

Grade A raw milk has an average bacterial count not exceeding 50,000 bacteria per cubic centimeter at the time of delivery to the customer. The milk ordinance prescribes definite and detailed conditions of sanitation for the dairy farm producing Grade A raw milk. Among the special requirements are rigid medical inspection of each employee of the dairy, and regular testing of the cows by a qualified veterinarian.

Grade A pasteurized milk is Grade A or Grade B raw milk which has been pasteurized, cooled, and bottled in a milk plant conforming to a number of specified rules of sanitation. The average bacterial count of Grade A pasteurized milk must not exceed 30,000 bacteria per cubic centimeter at any time after pasteurization until delivery to the consumer.

Grade B pasteurized milk is not less than B-quality raw milk which has been pasteurized, cooled, and bottled in a milk plant conforming to all of the requirements for Grade A pasteurized milk. The average bacterial count must not exceed 50,000 bacteria per cubic centimeter at any time after pasteurization and until delivery to the consumer.

HOME CARE

As soon as milk is delivered, the responsibility for its care lies with the purchaser. It must be kept cold, covered, and clean.

Keep Cold. A refrigerator should be used that will hold a fairly constant temperature in the milk compartment, not higher than 50° F. If milk and cream are to be kept longer than 24 hours lower temperatures are desirable. When some method of keeping milk cold is not available, it is wise to buy it as used, or to use either evaporated or dried milk.

Allowing milk to stand in a warm kitchen or on a sunny porch for several hours may raise its temperature as much as 10 degrees. This will cause a tremendous increase in the bacterial count which no amount of chilling afterward will reduce. (See Table XXV.) On delivery milk should be left in a sheltered place or a covered box, and be placed in the refrigerator as soon as possible after delivery. When milk is purchased from the store, place it in the refrigerator immediately on reaching home.

Keep the milk in the refrigerator as continuously as is practicable. When a small measure of milk is used from a bottle and the remainder is left standing in a hot kitchen during the time required to get a meal or bake a cake, the bacterial count increases surprisingly. One study showed that the rate of bacterial increase when milk stood for an hour and a half in a room at 75° F. was as great as that in another sample of the same milk kept in a refrigerator for 24 hours.

Keep Covered. Unless a protecting cap that fits well down over the rim is used, the top of milk or cream bottles should be carefully cleaned before the pasteboard cap is removed. Only the milk or cream likely to

Table XXV · *Increase in Bacterial Content of Six Samples of the Same Lot of Raw Whole Milk Kept at 40° F. before Delivery but Allowed to Stand for 1½ Hours at a Room Temperature of 75° F. before Being Placed in Household Refrigerators*

TEMPERATURE	ORIGINAL BACTERIAL CONTENT (PLATE COUNT)	RATE OF INCREASE			
		24 hours	48 hours	72 hours	96 hours
35° F.	31,000	2.4	2.6	4.5	5.9
40° F.	31,000	2.5	3.2	6.3	21.6
45° F.	31,000	3.4	23.2	83.5	152.5
50° F.	31,000	10.6	63.5	114.5	2467.7
55° F.	31,000	25.4	174.1	849.0	6483.8
60° F.	31,000	164.6	4032.2	15,483.8	Innumerable

be needed for immediate use should be poured out at any time. As long as any milk is left in the bottle it should be kept covered with the cap. Closely covering milk, cream, and butter excludes not only dust, bacteria, and particles of spoiled food, but also undesirable flavors and odors which dairy products readily absorb.

Keep Uncontaminated. New milk should never be mixed with old unless the mixture is to be used at once. Milk or cream that has been exposed to the air and to other containers (as in being poured out for table or cooking use) should not be poured back later into the general supply. All milk containers should be scalded after use and cooled before being used again. Small covered jars, jelly glasses, and cream bottles are useful for storing small quantities of cream or milk that are left over from a meal.

USES IN DIET

The simplest and most desirable form in which to use milk is as a beverage. All children should be taught to like milk in this form and to use it without added flavor. Since milk is a bulky food, care must be taken to see that it does not cut down too much the total amount of food used, or prevent by its bulk the inclusion of other needed foods in the diet. When there is a tendency to fill up on milk, and not to eat the remainder of the meal, it is a good idea to serve the milk after some of the main portion of the meal has been eaten, and the first edge of the appetite is satisfied. It is best taken along with the other food, and not all at once.

When for any reason milk is not used as a beverage in the diet, care must be taken to use it wherever possible in the preparation of food so as to insure a desirable amount in the diet. Skimmed milk, containing the valuable milk solids, not fat, with its high mineral and vitamin content, is especially useful in cookery. In either fluid or dried form it can be used in many milk dishes, and the fat requirement met by the addition of butter or margarine. Dried skim milk (nonfat dried milk solids) keeps well. When a supply is on hand, it is surprising to how many uses it can be put. It is easily added to any batter or dough mixture, increases the nutritive value of ready-to-cook cereals, and improves the flavor and nutritive value of mashed potatoes. To these and to many other dishes it can be added in dry form.

Dried milk is easily changed back to fluid form. To reconstitute dried milk to the composition of fluid skim milk, place ½ cup dried milk in a quart bottle or jar that can be tightly closed, and add 1 pint of lukewarm water. Shake well to combine without lumps. Larger amounts may be prepared with a suitable container, using the same basic proportions. For large quantities, a small household churn is specially useful.

Buttermilk can be prepared from reconstituted skim milk. Add 1 to 2 tablespoons of a good buttermilk as a starter to each quart of fluid skim milk, prepare as directed above, and hold at room temperature until it has fermented, then chill.

MILK COOKERY

Milk is used as the liquid ingredient of many prepared dishes. Among the dishes in which milk is an important component are cream soups, chowders, cream sauces, puddings, and custards. These are all discussed in other chapters.

Special Precautions. When milk is the main component of any dish there are certain precautions which must be observed.

Scorching. Milk tends to stick to the bottom of the pan in which it is heated. This is due to the coagulation of the proteins other than casein in the milk. Though present in small amounts, these coagulate when heated and tend to settle and stick to the bottom of the pan. Sometimes this protein scorches and gives a bad flavor to the mixture. This scorching can be prevented by an occasional stir when cooking over direct heat or, better still, by heating the milk in a double boiler.

Scum. A scum forms on heated milk. This scum is objectionable and can be prevented. It results from a drying out of the top of the milk when heated in an uncovered container. It is tough and holds in the steam and may cause the milk to foam and boil over unless carefully watched. Scum formation can be avoided by covering to prevent evaporation while heating in a double boiler, or by careful stirring to prevent the drying out of the surface layer of milk cooked over direct heat. When hot beverages containing milk must stand uncovered for a time, beating forms a foamy layer over the top, which retards evaporation and scum formation.

Curdling. Acid curdles milk. When materials containing even a very little acid are added to hot milk, the milk tends to curdle. This sometimes happens in making fudge (see page 41) but can be prevented by adding the chocolate after the sirup has been concentrated. The thickened sirup prevents the separation of the casein.

The most common example of curdling is the behavior of milk in the preparation of cream-of-tomato soup. When acid is to be added to milk, the casein can be held in suspension by thickening the milk with starch before the acid-containing ingredient is added. In making cream-of-tomato soup either the tomato juice or the milk can be thickened before the two ingredients are combined.

Some special ways of using milk are discussed below.

Beverages. Whole or skim milk is used as the basis of a number of hot and cold beverages. These afford variety to persons who require large quantities of milk daily.

Chocolate and **cocoa** are probably the most popular milk beverages. They are good served either hot or ice cold. Both are easily and quickly made at home from whole or fluid skim milk, or from dried, evaporated, or condensed milk. (See page 346.)

Café au lait is a mixture of hot milk and very strong coffee. Equal amounts may be used or the two may be served separately and the proportions adjusted to suit the taste. This beverage may be served sweetened or unsweetened, and with or without cream.

Milkshakes and eggnogs are nutritious drinks. In a milk shake, the flavoring, sugar, and milk are shaken or beaten to combine them. Milkshakes should be cold and frothy. To make a smooth eggnog, 1 cup of milk should be beaten into an egg, a whole egg, or two yolks, combined with 1 to 2 teaspoons sugar, flavoring added, and the mixture chilled before serving.

Buttermilk lemonade is a refreshing and nutritious drink made of buttermilk, lemon juice, and sugar. It is made in the same way as ordinary lemonade, except that more sugar and lemon juice are needed to flavor it properly. Buttermilk lemonade should be served very cold.

Cream Soups. Cream soups are an excellent means of using milk, and skim milk can be used just as acceptably as whole milk. The fat lacking in the skim milk can be made good by the addition of butter, margarine, or some other fat with desirable flavor.

The vegetables often used in making milk soups are corn, asparagus, cabbage, cauliflower, peas, potatoes, turnips, beans, tomatoes, celery, and spinach, either alone or in pleasing combinations of two or three kinds. Peanut butter, salmon (or other fish), or grated cheese may be used as the main flavoring material instead of vegetables. For proportions and methods of preparation, see page 64.

The preparation of cream-of-tomato soup offers a special problem. The tomatoes should be cooked with desired seasonings until thoroughly softened. To each cup of tomatoes use one or two cloves, half a bay leaf, a small piece of onion, a little celery, and parsley. The mixture should then be puréed, rubbed through a strainer, as much of the tomato pulp being pressed through as possible. The proportion of tomatoes to milk depends upon the concentration of the tomatoes and the flavor desired. Equal parts of tomatoes and milk are a good combination. One tablespoon fat and 1 tablespoon flour are required for each cup of total liquid (tomato juice and milk). The fat should be melted and the flour stirred into it until they are thoroughly combined. Pour the hot milk over the fat-flour mixture, stirring constantly, and bring to a hard boil. Add the tomato pulp and juice and heat to serving temperature, not to a boil.

The use of soda in tomato soup is objectionable and unnecessary. Tomatoes vary so much in acidity that it is difficult to add just enough soda. Any excess soda contributes an undesirable flavor; a small amount of soda neutralizes the acid of the tomato, and modifies the desirable tart flavor of the soup.

Cottage Cheese. In the preparation of cottage cheese the influence of both acid and heat on casein is demonstrated. Milk (usually skimmed) is allowed to sour naturally. The curd which forms is separated by straining through cheesecloth. When the curdled milk is drained without heating, a soft cheese is obtained. If the curdled milk is heated to about 104° F., the casein is separated from the whey more completely and the curd is less soft. Heating to too high a temperature should be avoided since the casein becomes tough and rubbery at high temperature.

Rennet Custard. The enzyme rennet is used to clot milk in the preparation of the dessert known as rennet custard or junket. Rennet or junket tablets are prepared from an extract of the mucous lining of the calf's stomach.

In preparing rennet custard, the milk is sweetened and flavored before the addition of the rennet, since the action of the enzyme commences immediately and the milk must not be stirred after it has been added. The flavored milk is heated just to body temperature (98.6° F, the temperature at which the enzyme acts best), and the enzyme is added in the proportion indicated on the package. Caramel, maple, almond, and vanilla are good flavorings for junket. Crushed fresh fruits, fruit syrups, or crushed peanut brittle may be served with it for variety.

SOUR CREAM

Sour cream is available in some markets. Because of its usefulness in food preparation, at least one dairy in most large cities specializes in its production. It can easily be prepared at home.[1]

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[1] *Sour Cream;* Leaflet No. 213, United States Department of Agriculture, Washington, D.C.

Its acidity makes it specially desirable for use in certain sauces, salad dressings, and characteristic desserts. When used in uncooked salad dressings and desserts, it is whipped before being combined with the other ingredients. The air incorporated thickens the cream and increases its volume. It should be kept cold (below 50° F.) during whipping to prevent the formation of butter. Overwhipping should be avoided.

In baked goods sour cream furnishes liquid and all or part of the fat; with the addition of soda, it may be used to leaven mixtures for baking.

WHIPPED CREAM

Air may be incorporated in cream, producing a foam or whipped cream. The whipping quality of a cream and the stiffness and degree of permanence of the resulting foam depend upon several factors. Among these are the amount of fat in the cream, its viscosity, and the temperature of the cream when whipped.

To form a stiff, stable foam, cream should have from 30–35 per cent fat. Less fat gives a fluffy foam of low stability; more gives a foam of low volume with a tendency to form butter.

The viscosity of the cream is influenced not only by the fat content but by the age of the cream. Raw cream should be aged at least 4 hours at 45°–50° F.

Pasteurization decreases whipping ability but this is restored to a certain extent by aging. Pasteurized cream requires much longer aging than fresh cream. The time will vary with the fat content. Homogenization also decreases the whipping value. It is almost impossible to whip cream that has been both pasteurized and homogenized.

Cream whips more quickly and forms a stiffer foam at a temperature of about 40° F. than when warmer. The whipping temperature should not be higher than 45° F.

While an egg-beater (Dover) can be used, a turbine type beater gives better results. Do not whip too much at one time. After whipping, cream can be kept for several days if stored at 40° F.

Sugar decreases the stiffness of the foam. It should be added after whipping.

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IX · Cheese and Cheese Cookery

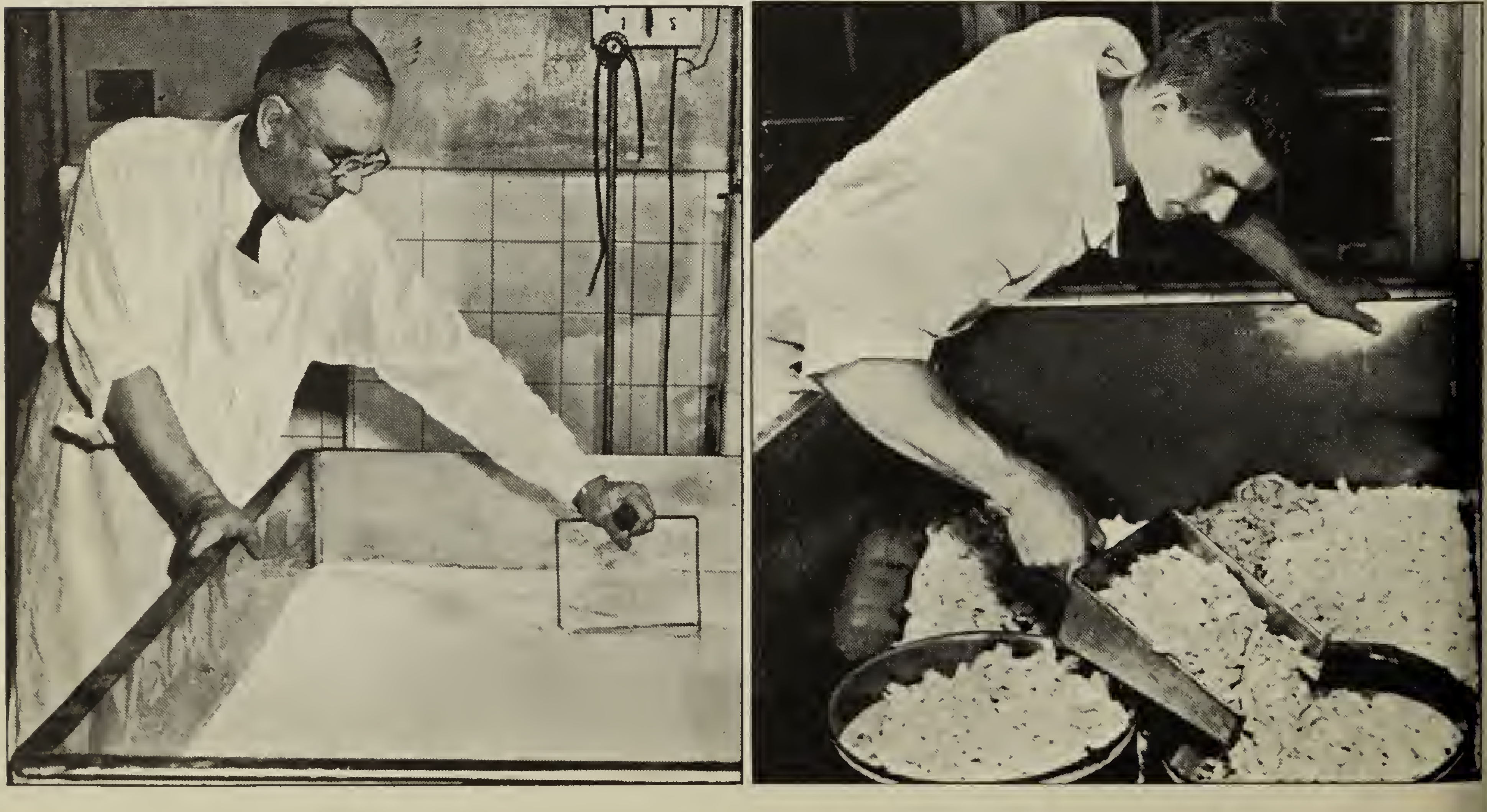
Cheese is made from the curd of milk. The milk may be whole, partly skimmed, or skimmed milk, with or without added cream. In this country most cheese is made from cow's milk.

In making cheese, the casein of the milk is coagulated with rennet or precipitated with lactic or other acid. The curd formed is then separated from the liquid portion of the milk called the "whey." This soft curd without further treatment, other than the addition of salt and in some cases cream, is used in a group of unripened cheeses. Cottage and cream cheese are typical of this group.

To make ripened cheeses, the curd is submitted to varying degrees of heat and pressure. Special cultures of bacteria or molds are added, the curd is formed into shapes typical of the particular type of cheese, and allowed to cure or ripen under specific conditions. The distinctive flavor of cheese is largely dependent upon changes brought about during the ripening process.

DEVELOPMENT OF CHEESE-MAKING

Cheese-making originally developed as a means of preserving the principal nutrients of milk at times and in places where satisfactory storage facilities for milk were not available. In this case the milk was allowed to sour or ferment naturally and the separated curd was stored for future use. This



Making Cheddar Cheese · (*Left*) A special knife is used to cut the curd as the first step in separating the curd from the whey. This step is followed by heating, stirring, and draining; (*Right*) the separated curd is filled into hoops lined with cheesecloth and submitted to pressure to remove additional whey before curing

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curd developed flavors characteristic of the place and conditions under which it was stored. In this hit-or-miss way many different kinds of cheese were developed, each with its characteristic flavor and texture.

With the development of microbiology, the role of bacteria, yeasts, and molds in the ripening of cheese was made clear. This knowledge has been applied in the working out of scientific methods to replace the rule-of-thumb procedures originally used.

Cheese-making has come to be an important industry, by means of which the nutrients of milk are stored in surplus producing seasons and areas and distributed to consumers in palatable and less perishable forms than fluid milk. Through scientific research, the amount of cheese has been increased and its quality improved to provide this stable source of milk nutrients, for both domestic and export markets. At the same time, progress has been made in the study of organisms and conditions of curing required for the production of special kinds formerly available only through import. The industry has demonstrated that many cheeses, which at one time were produced only in certain localities in Europe, can be made in the United States.

VARIETIES OF CHEESE

While there are more than 400 different kinds of cheese, there are only 18 or 20 different basic varieties. These differ from one another in the kind of milk used, the amounts of fat and water retained in the curd, and the flavor and texture produced during ripening. While some cheeses are uncured, by far the most stable and, therefore, the most important in industry are the cured or ripened cheeses. During curing characteristic flavors are developed among and within varieties. To these, names of local origin were given, frequently the name of the town in which the cheese originated.

On the basis of the differences mentioned above, cheeses are designated as cured (ripened) or uncured (unripened); high fat or low fat; soft, semihard, or hard; and mild or strong. These terms are used in describing the cheeses listed by their common names on pages 131 to 132.

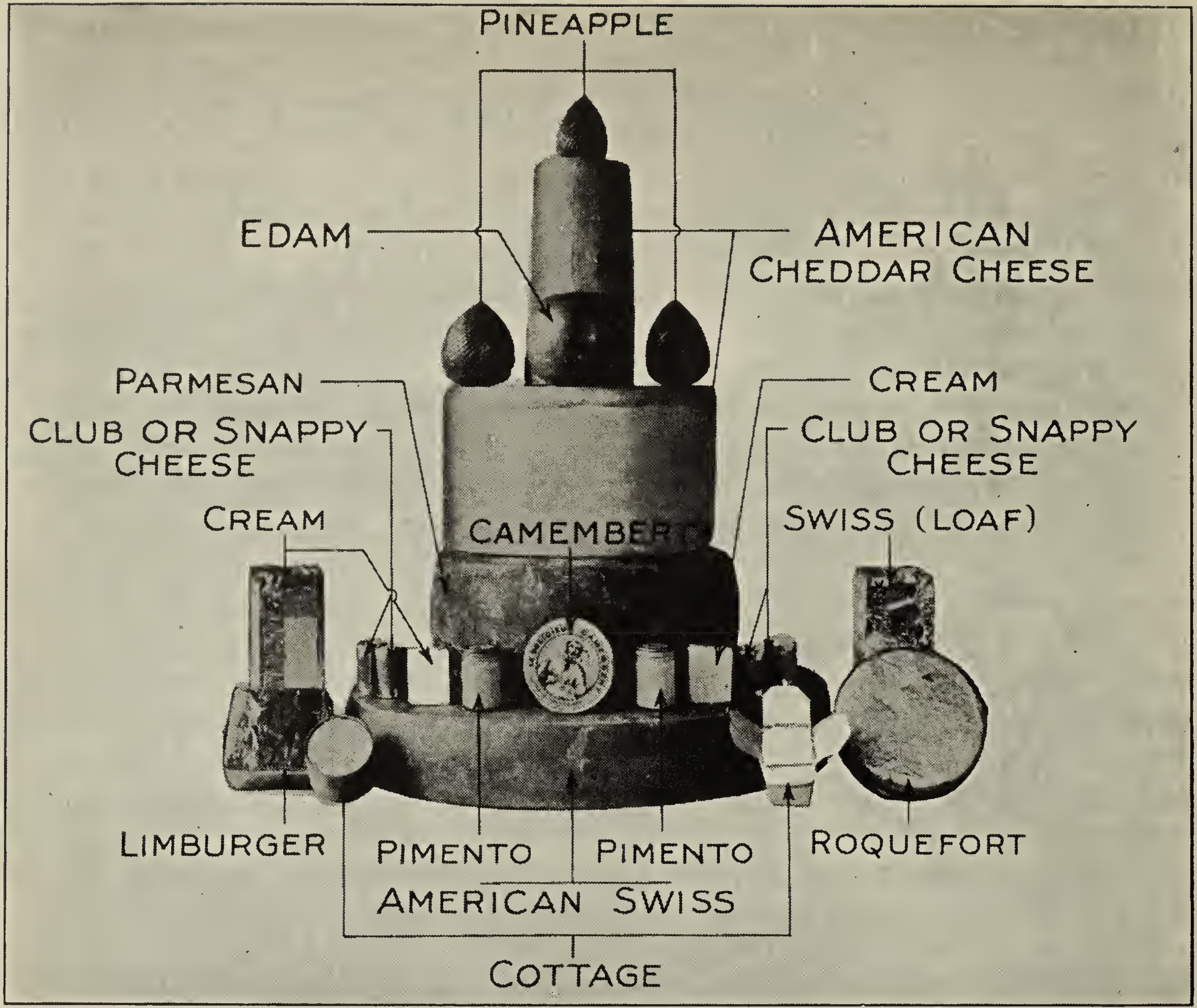
The most common types of hard cheese are Cheddar and Swiss (Emmenthaler). Both these are ripened by bacteria distributed evenly throughout the curd and are cured in large forms of varying shapes and sizes. Cheddar cheese may have color added. Swiss cheese has no added color and has characteristic holes throughout, which are the result of gas formation during curing.

Brick, Muenster, and Limburger are typical of the semihard cheeses; and cream (unripened), Brie, and Camembert of the soft types. The organisms causing ripening are applied on the surface and penetrate the mass during ripening. For this reason the soft cheeses are molded in small forms.

In the United States, when the term cheese is used without qualification, it refers to Cheddar cheese, sometimes called American or American Cheddar.

Process Cheese. This is a pasteurized cheese made from blending one or more different lots of cheese with the aid of heat, with or without the addition of water, and with not more than three per cent of a suitable emulsifying agent. An unqualified process cheese means process Cheddar. It must contain not less than 60 per cent solids, half of which must be milk fat.

Process cheese by a varietal name must conform to the limits of moisture and fat required for that variety. A cheese of uniform quality, easily sliced and melted, results from processing. The flavor of process cheese, however, is very mild. Process cheese is sold packaged in from one-fourth-pound to five-pound cakes.



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Different Types of Cheeses, Showing Variety of Shapes

Cheese Spreads. The term "cheese spread" is applied to any packaged form of cheese which may be easily spread with a knife at ordinary room temperature. These include: (1) soft cheeses, such as cream cheese, usually mixed with olives, pickles, pimiento, and onions; (2) process cheeses of such consistency that they will spread, usually with additions; and (3) cheese foods, which are usually process American Cheddar cheese to which concentrated whey, dried skim milk, cream, etc. are added and the mixtures made to a spreading consistency with liquid or fat or both.

These latter products cannot be sold as cheese under the Federal Food and Drug regulations, and so are sold under trade names. Their spreading qualities are due to the moisture content, the fat content, or both.

Standards for cheese are set in terms of fat and water content. Cheese must contain the minimum amount of fat specified for the variety and not more than the maximum amount of water permitted.

COMPOSITION AND NUTRITIVE VALUE

Cheese is a concentrated and highly nutritious food. Approximately 10 pounds of milk go into every pound of cheese that is manufactured. Five ounces of American Cheddar cheese are usually accepted as the equivalent in food value to one quart of whole milk.

Proximate Composition. The different kinds of cheese vary in composition, but the ripened cheeses made from whole milk contain approximately one-fourth protein, one-third fat, and one-third water. American Cheddar cheese contains approximately 20 to 25 per cent protein, more than 30 per cent fat, about 39 per cent water, the remainder being made up of salt, milk sugar, lactic acid, and minerals.

High-Quality Protein. Like meat and eggs, the protein of cheese is excellent for building body tissue. It is chiefly casein with a small amount of albumin. In ripened cheese, much of the casein has been changed to soluble proteins and even to proteoses, peptones, and in some cases to amino acids and ammonia.

Energy Value. The amount of energy supplied by cheese varies with the fat and water content. A one-inch cube of American Cheddar cheese furnishes approximately 100 calories.

Minerals. Cheese is high in calcium and phosphorus and, therefore, is an excellent food for building strong bones and good teeth and for keeping them in repair.

Vitamins. Full-fat cheese is a good source of vitamin A. Cheese, like other milk products, is an excellent source of riboflavin.

Digestibility. On the average, about 95 per cent of the proteins and over 95 per cent of the fat in cheese are digested and absorbed. This compares favorably with the body's utilization of other foods. The compact texture and high fat content may in some instances interfere with the ease of digestion unless the cheese is prepared properly and used correctly in the meal.

The compactness may be taken care of by grating and by using the cheese in combination with other foods. The high fat content may be diluted by appropriate combinations of the cheese with carbohydrate foods. The fat tends to increase the length of time that it takes the cheese to digest and thus stave off hunger. The fat is in a finely divided condition, though not as perfectly emulsified as it was originally in the milk.

Use in the Diet. There are two important uses of cheese in the diet: first, as an integral part of a well-balanced meal to supply protein and energy; and second, to add flavor to bland foods and give zest to the meal.

In the use of cheese as a source of protein and energy, the milder-flavored varieties are best, not only because they are less expensive but because they can be used in larger amounts.

The more highly flavored varieties should be depended upon when cheese is used chiefly for flavor. This type of cheese, sparingly used, makes an excellent appetizer and an equally good ending to a meal. Thus it stimulates digestion and helps to make meals interesting.

SELECTION AND BUYING

In order to select cheese wisely for the use desired, a knowledge of the different varieties is necessary. Cost, flavor, and grade are three guides to selection. The different varieties vary in cost; there is a range in cost within a single variety depending on the quality and length of ripening.

Flavor. American Cheddar cheese may be "mild" or "sharp"—the "sharp" having been allowed to age or ripen from eight months to two years, while the "mild" is from four weeks to seven months old. Sampling is the best guide to flavor.

Grades. Many of the European-type cheeses are valuable for the flavor which they contribute to the diet, as well as for their food value. These vary considerably in price. Legal standards for some types of cheese have been established by the United States Department of Agriculture. American Cheddar, for example, must contain no more than 39 per cent moisture. Similar standards are established for other varieties of cheese.

Voluntary grades also have been set up by the United States Department of Agriculture for American Cheddar cheese. Some manufacturers have taken advantage of this service and their cheese carries the grade mark on the rind or package. First qualities are represented by 93 and by 92 score. This is a guide to the consumer.

Kinds and Cost. The kind of cheese frequently is designated by the place where it was first made. Most cheeses originally made in other countries are now produced in the United States but they must be so labeled. All the dairy states produce some cheese. Since the milk which is not required in the fluid milk or butter market goes into cheese, cheese production varies with the demand for fluid milk. At present, Wisconsin leads the states in cheese production.

Cheddar is the most popular cheese in this country and the amount consumed exceeds that of all other kinds combined. Plymouth, Wisconsin, is the principal cheese exchange for American Cheddar. The wholesale prices of this cheese are established there and quoted in all leading city markets.

The cost of most special cheeses is determined largely by flavor, not by food value.

Swiss Cheese · A cut through this large Swiss cheese (200 pounds) shows the large holes typical of this type of cheese

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Table XXVI · ***Principal American and Imported Cheeses***

[Practically all made in the United States now.]

Name	Country of Origin	Characteristics	Usual Weight	Shape	Ripening	Use
American Cheddar	England, but now leading in United States	Hard; white to orange inside; mild to sharp; waxed surface	10 to 80 lb.	Circular; cylindrical	4 weeks to 2 years	General; processing
Bel Paese	Italy	Soft to semisoft; light yellow inside; gray surface	1 lb.	Circular, 2 in. high	3 months	Dessert
Blue	France; now common in United States	Semihard; green mold; cow's milk	5 lb.	Cylindrical, $4\frac{1}{2}$ in. high	2 to 9 mo.	Appetizers; dessert
Brick	United States	Semihard; creamy yellow inside; brownish outside; sweetish in taste	Usually $4\frac{1}{2}$ to 5 lb.; Jumbo, 11 to 12 lb.	Rectangular $2\frac{1}{2} \times 5\frac{1}{2} \times 11$ in.	2 to 9 mo.	General
Brie	France	Soft; mold-ripened; creamy yellow inside; brown outside	2 lb.; 4 lb.	Circular, 2 to 3 in. high	4 weeks	Dessert
Caciocavallo . .	Italy	Hard; light inside; gray outside; smoked	2 to 5 lb.	Tenpin or beet root	None to several months	Table; grating
Camembert . . .	France	Soft; mold-ripened; creamy yellow inside; grayish white outside	8 oz. and $1\frac{1}{2}$ lb.; $1\frac{1}{2}$-oz. portions	Circular; triangles	4 weeks	Dessert
Chantelle	United States	Semihard; yellow inside, creamy; red coat; robust, mellow flavor		Circular cake	Cured	Dessert; general
Cheshire	England	Very high color; cheddar type; sharp	50 to 70 lb.	Cylindrical, 14 to 16 in. diameter	8 to 10 mo.	Table
Colby		More open body than Cheddar; mild, mellow, or sharp				
Cottage (Schmierkäse)	Unknown Germany	Soft curds; white	1 pound packages; bulk		None	Table
Cream	United States	Soft, smooth; white to cream	3-to-6-ounce pkg.; several pounds	3 × 2 × 1 inch; loaf	None	Table; dessert
Edam	Holland	Hard; yellow inside; red outside	2 to 6 lb.	Ball	1 to 3 mo.	Table; dessert
Emmenthaler (Swiss)	Switzerland	Hard; light yellow inside; gas holes from bacteria	60 to 225 lb.	Circular; blocks	3 to 10 mo.	Table; processing
Gorgonzola . . .	Italy	Semisoft or soft; yellow with green mold inside; gray outside	16 to 19 lb.; 2 to 5 lb.	Cylindrical; 12 in. diameter	3 months to 1 yr.	Table; dessert
Gruyère	France; Switzerland	Semisoft; light yellow inside; processed Swiss	8-ounce pkg.; individual portion; 2 lb.	Circular pkg.; triangular portions; loaf	None	Table; dessert
Hand (Harz) . .	Germany	Semihard; pungent odor and taste	Varies; 4 oz. to ?	Varies	Varies	Table
Jack (Monterey)	United States	Soft; whitish inside and outside	6 to 7 lb.	Circular	3 to 4 weeks	Table; dessert
Liederkranz . . .	United States	Soft; creamy inside; russet outside; bacteria-ripened; strong flavor; resembles Limburger	4 oz.	Rectangular; $1\frac{1}{2} \times \frac{2}{3} \times \frac{1}{2}$ in.	4 weeks	Dessert
Limburger . . .	Belgium; Germany	Semihard; creamy white inside; grayish outside; bacteria-ripened; strong odor	6 oz. to 2 lb.	Cubical; rectangular (6 × 6 × 3 in.) jars	1 to 2 mo.	Table

Table XXVI (continued) · *Principal American and Imported Cheeses*

[Practically all made in the United States now.]

Name	Country of Origin	Characteristics	Usual Weight	Shape	Ripening	Use
Muenster	Germany	Semihard; creamy-white inside; yellowish outside; sweetish taste	4½ to 6 lb.	Circular; block	None to 2 mo.	Table
Mysost (Primost) .	Scandinavian countries	Semihard; light brown; buttery; sweetish	8 oz. to 1 lb.	Cubical; cylindrical	6 to 8 mo.	Table
Neufchâtel . . .	France	Soft, smooth; white inside; similar to cream cheese	2½ to 3 oz.; 2 to 3 lb.	Rectangular; loaf	None	Table dessert
Parmesan (Grana)	Italy	Very hard; yellowish-white inside; green outside	50 to 60 lb.	Cylindrical; 20 in. diam.	Several years	Grating
Pineapple (a form of American Cheddar)	United States	Hard; deep yellow inside; orange outside	10 oz. to 5 lb.	Pineapple	6 to 8 mo.	Table
Port de Salut (also called Oka and Trappist)	Canada	Semisoft; creamy yellow inside	1 lb.; 5 lb.	Circular cake	5 to 6 weeks	Table; dessert
Provolone . . .	Italy	Hard; light yellow inside; light tan outside; rope marks; smoked	Varies from 2 to many pounds	Like big sausage links	2 to 3 mo.	Table
Romano	Italy	Hard; yellowish-white inside; greenish-black outside; sharper than Parmesan	12 to 15 lb.	Circular; 10 in. diameter	8 to 10 mo.	Grating
Roquefort . . .	France	Semihard; green mold inside; sheep's milk; foil-wrapped	4½ to 6 lb.; individual portions	Cylindrical; triangles	3 to 9 mo.	Appetizer; dessert
Sapsago	Switzerland	Hard; green; flavored with clover leaves	4 oz.	Conical	6 mo. to 2 yr.	Grating
Sbrinz	Argentina	Hard; white inside; greenish outside	12 lb.	Circular	6 mo. to 2 yr.	Grating
Stilton	England	Semisoft; creamy with green mold inside	12 to 15 lb.	Circular	6 mo. to 2 yr.	Table; dessert
Swiss	Switzerland	See Emmenthaler				

Those low in cost have the same nutritive value as the more expensive kinds.

Table XXVI gives the names of many American and European-type cheeses, with some of the characteristics of each, the sizes available, amount of ripening, and uses. It will serve to assist the consumer in learning the kinds of cheese and how best to make use of them in planning meals.

Some of the kinds named are examples of the same basic variety. The Blue cheese of France, the United States, and South America belongs to the same variety as Roquefort. The growth of the same mold is responsible for the appearance and the flavor of these cheeses. True Roquefort, however, is made from sheep's milk while Blue cheese is from cow's milk. Gorgonzola of Italy and Stilton of England belong to the same basic variety.

CARE AND STORAGE

Soft cheeses must be given the same care as any other perishable food. They should be wrapped in waxed paper or placed in a covered container to prevent loss of quality by drying; then they should be stored in the refrigerator to retard the growth of organisms which cause spoilage.

Hard cheeses keep longer than the soft varieties, but cut surfaces will allow the cheese to dry. Also microorganisms, especially molds, will develop and cause deterioration unless the cheese is stored at low temperature.

Whenever packaged cheese is used, the container should be saved and any left-over cheese stored in the original wrapper, with the edges folded over carefully to prevent loss of moisture. Bulk cheese should be wrapped in waxed paper; or kept in a zippered cellophane, oiled silk, or plastic bag or a covered container. For long keeping, wrap Cheddar cheese or any hard variety in a cloth wrung out of vinegar water (1 tablespoon vinegar to ½ cup of water), and then wrap in waxed paper. When cheese is kept longer than a week, dampen the cloth in vinegar water again and rewrap. Ungrated parmesan cheese may be kept for months in this way.

Store left-over grated or shredded cheese in a screw-top jar in the refrigerator.

PREPARATION AND COOKERY

Uncooked cheese is best served at room temperature, and so should stand outside the refrigerator for a short time before serving.

Principles of Cookery. Heat affects the protein in cheese in much the same way as it does the protein in eggs: when overcooked the protein becomes tough and rubbery. Overcooking may result from too high a cooking temperature or too long a cooking time. Overcooking gives cheese a bad texture and may decrease the ease of digestion.

In cooking cheese, two points are important: one is to avoid overcooking; the other is to make its form less compact by combining it with other foods. When made into cooked dishes, the texture may be modified by the distribution of starches or other foods not coagulated by heat among the cheese particles. In such dishes there is less danger of overcooking the cheese. These are easier to prepare with a satisfactory texture than dishes of cheese alone, cheese diluted only with a liquid, or cheese and egg combinations without starch. The addition of air in egg white gives to cheese-egg combinations a spongy texture which increases their ease of digestion.

A plastic or semihard cheese blends more readily in mixtures than a hard cheese. The latter should be grated or shredded for combining. Well-ripened Cheddar blends more readily than that which is underripened. Process cheese combines very easily with other ingredients, due to its increased moisture content. Only slicing or chopping is necessary before blending it in a sauce.

Cheese Dishes. Typical dishes are these: (1) macaroni or spaghetti and cheese, (2) Welsh rabbits, and (3) cheese omelets and soufflés.

Macaroni and cheese. If grated cheese is added to the macaroni (or spaghetti) immediately before serving, any danger of overcooking the cheese is avoided. Or the cheese and macaroni or spaghetti may be served in separate dishes and combined at the time of serving, in the proportions that suit the individual taste.

Another way of preparing macaroni and cheese is to melt the cheese in a medium cream sauce (p. 63), using equal measures of cream sauce and shredded or chopped cheese. From half as much to equal meas-

Macaroni and Cheese · Macaroni baked with cheese makes a good main dish

ures of sauce and cooked macaroni are used. Alternate layers of the macaroni and sauce are arranged in a baking dish and this combination is heated through and browned on top in a moderate oven.

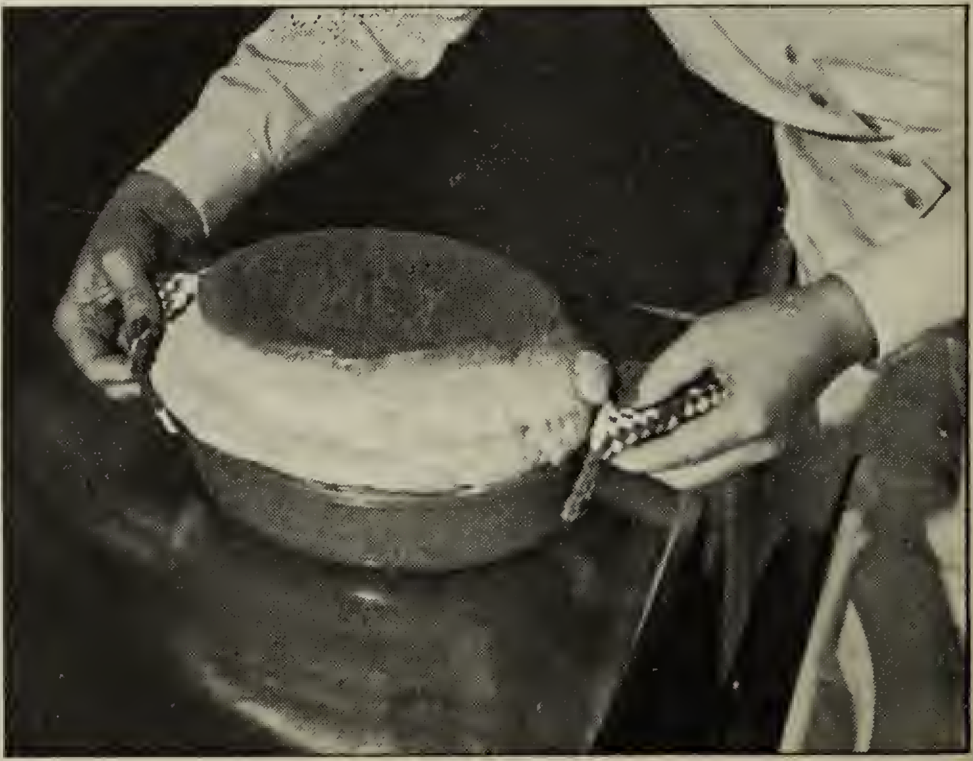
Welsh rabbit. Welsh rabbit is made by thickening a liquid with the cheese. The liquid is usually milk, evaporated milk, or cream, although beer is sometimes used for special flavor. The thickening may be done with the cheese alone, or with flour or egg, or a combination of flour and egg, by using a cream sauce, a custard, or a combination custard base.

When cheese is the only thickening, basic proportions are approximately four times as much cheese, by measure, as liquid. Place 1 cup grated cheese or sliced process cheese in a double boiler. Add $\frac{1}{4}$ cup milk or other liquid and stir, heating slowly, until the cheese is melted and the mixture blended. Salt, cayenne, paprika, mustard, Worcestershire, and other seasonings are added as desired. A Welsh rabbit is usually served over toast or crackers.

For a Welsh rabbit made on the basis of a custard, make a soft custard, using 1 cup milk and at least 1 egg or 2 yolks. (See page 110 for custards.) Blend from 1 to 2 cups shredded cheese with the custard in the double boiler and season as desired.

Cream-sauce Welsh rabbits are easier to prepare than those made with liquid alone or those on a custard base. In their preparation, a medium to thick cream sauce is made, using 2 to 3 tablespoons flour and 1 tablespoon butter or margarine to each cup liquid. The amount of cheese to sauce may vary, but from equal measures to twice as much cheese as liquid are good basic proportions. A cream-sauce Welsh rabbit may need more seasoning than the other types.

Welsh rabbits are made most often, perhaps, on a combination-custard basis, that is, using both flour and egg for thickening. A medium cream sauce is made with 2 tablespoons flour and 1 tablespoon butter or margarine to 1 cup liquid. After the sauce is thoroughly cooked and then cooled slightly,



Cheese Soufflé · (*Upper left*) The cheese is added to the cream sauce. (*Lower left*) Folding in the whites carefully. (*Lower right*) The end product should be light and fluffy and golden brown

Krafts Food Co.

a beaten egg yolk and the grated cheese are added to the sauce. The egg is cooked and the cheese blended with the other ingredients in the double boiler, with constant stirring. Cheese and seasonings are used in approximately the same proportions as in the custard or cream-sauce rabbits.

Omelets and soufflés. Cheese is frequently prepared in the form of omelets and soufflés. (See page 106 for omelets.)

A soufflé is a baked cream-sauce omelet. A cheese soufflé is one of the most attractive of all cheese dishes. The amount of cheese to cream sauce depends upon the flavor of the cheese; but the amount of cream sauce to egg must be such that the air in the egg white will leaven the mixture, making it light and fluffy. Basic proportions are about $\frac{1}{4}$ cup thick cream sauce to each egg. A recipe follows:

Cheese Soufflé

3 to 4 tablespoons butter or margarine
3 to 4 tablespoons flour
1 cup milk
4 eggs, separated
1 to 2 cups grated cheese (depends on flavor)
$\frac{3}{4}$ to 1 teaspoon salt
Dash of cayenne
Mustard and paprika, as desired

After the cream sauce is thoroughly cooked and smooth, it is removed from the heat. The cheese is added and stirred until it is melted. Then the well-beaten yolks and seasonings are added and thoroughly mixed. This mixture is poured slowly into the stiffly beaten whites and the whole carefully but thoroughly blended. Then it is poured into a casserole, greased in the bottom, and baked at 300° F. for about one and a quarter hours or until a spatula inserted into the center comes out clean.

Cheese fondue. A cheese fondue is a variation of cheese soufflé. In this dish, bread crumbs are used for thickening instead of flour. General proportions for a fondue are equal measure of milk, crumbs, and grated cheese. To 1 cup each of these ingredients, from 2 to 4 eggs are used, the stiffly beaten whites folded in last, as for a soufflé. It is then baked in a large casserole or in custard cups.

Cheese as Seasoning. Cheese is used as a means of adding flavor and food value to many dishes. Its use with macaroni, spaghetti, and other pastes is referred to above. It also may be used in seasoning vegetables by blending into a sauce, or used in the preparation of the au-gratin dishes.

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X · Fats and Their Uses in Cookery

Fat is essential for the proper functioning of every living cell and is found in small amounts in all natural foods. Many foods, such as whole milk and cream, fat meats and fish, soybeans, nuts, egg yolk, cheese, olives, and avocados, contribute important amounts of fat to the diet. Fat contained in foods, the so-called "invisible" fat, makes up about one-half the fat in the diet.

Just as some plants store their excess energy in the form of sugar or starch, so others store their reserves of energy in the form of fat. The fat is separated from the parts of the plant where it is stored—cotton seed, peanuts, soybeans, and corn germ—and reaches the consumer in visible form, as the fats and oils of commerce. In tropical areas, nuts, especially coconuts and palm nuts, are abundant sources of fats.

Since animals store all their excess energy in the form of fat, one of their important functions in food economy is to convert the more abundant plant carbohydrates into this more concentrated form of energy. Much of the corn grown on the rich farm lands goes to market in the form of pork and corn-fed beef. In addition to well-marbled muscle meat, these products yield considerable amounts of visible fat, which reaches the consumer in the form of oleomargarine, lard, and other household fats.

In separated or visible form, fats and oils contribute essential nutrients and flavor to the diet, and serve many useful functions in the preparation of food. This chapter discusses the selection and use of these fats and oils. As a basis for this discussion it is necessary to understand, in a general way, the chemical structure of fats and the properties which determine and limit their use.

Fats, like carbohydrates, contain only the elements carbon, hydrogen, and oxygen. Just as the carbohydrates are built from the simple sugars, fats are built from combinations of a series of acids, called "fatty acids," and glycerin. Each molecule of glycerin combines with three molecules of one or more fatty acids with the elimination of water, in accordance with the general reaction indicated by the simple equation given below:

$$3 \text{ fatty acids} + \text{glycerin} = \text{fat} + \text{water}$$

During the war, when there was a shortage of fat, soap, and glycerin, there were advertisements in the newspapers urging women, as a patriotic duty, to turn in all waste fats for use in making soap. In the commercial manufacture of soap, glycerin is a by-product which had many important wartime uses.

In making soap, fat is heated with a strong alkali, such as lye (sodium hydroxide). This splits the fatty acids off from the glycerin portion of the fat and the fatty acids combine with the sodium portion of the lye to form sodium salt or soap. The remaining portion of the fat combines with the hydroxyl portion of the lye to form glycerin. This reaction is shown in the simplified form of the equation given below:

$$\text{Fat} + \text{sodium hydroxide} = \text{soap} + \text{glycerin}$$

	Saturated	Unsaturated
Table XXVII · *Fatty Acids Frequently Found in Foods*	Butyric, 4 carbon atoms	Oleic, 18 carbon atoms, lack 2 hydrogen atoms
	Caproic, 6 carbon atoms	Linoleic, 18 carbon atoms, lack 4 hydrogen atoms
	Caprylic, 8 carbon atoms	
	Capric, 10 carbon atoms	Linolenic, 18 carbon atoms, lack 6 hydrogen atoms
	Lauric, 12 carbon atoms	
	Palmitic, 16 carbon atoms	
	Stearic, 18 carbon atoms	

KINDS OF FATTY ACIDS

Most fats contain mixtures of fatty acids. At least 40 have been identified in food fats, but five of these—stearic, palmitic, butyric, oleic, and linoleic—are the ones most abundantly represented in the visible food fats. These fatty acids vary in two important respects: the number of atoms of carbon and the relative amount of hydrogen they contain. Fatty acids are called saturated when they have combined with all the hydrogen possible. In Table XXVII the more important fatty acids are listed as saturated or unsaturated. The number of carbon atoms contained and the number of hydrogen atoms lacking in the unsaturated acids are indicated.

PROPERTIES OF FATS

The properties of the fats and oils vary with the fatty acids they contain. All fats are insoluble in water and lighter than water. Even though salad oil is mixed thoroughly with the vinegar or lemon juice used in the preparation of French salad dressing, on standing the dressing separates into two layers, the oil on the top and the solution of acid in the water on the bottom. The fat in milk is not in solution but is held in suspension in the form of an emulsion. On standing it separates as the cream layer on the top of the milk, because the fat is lighter than the other constituents of the milk.

Instability. Fats are unstable chemically and unless carefully handled become rancid and develop disagreeable odors and flavors. This is due to decomposition resulting from a complex oxidation process and other, less understood causes. The products of decomposition are responsible for the unpleasant flavors and odors.

Knowledge of the factors causing deterioration of fats was advanced considerably as the result of research during the war. The necessity of supplying fats and fat-containing foods to our soldiers in tropical areas and under field conditions intensified the need for such information. Although the problems have not all been solved, it is known that deterioration of fats is hastened by high temperatures, light, and exposure to air.

Melting Temperatures. Some fats are solid and some liquid at room temperature (65° to 75° F.). While chemically all are fats, those which are liquid at ordinary temperature and can be poured are called oils. An oil is a liquid fat. The point of temperature at which a fat changes from a solid to a liquid form is called the melting point. The fats containing large amounts of the saturated fatty acids and the acids with the larger numbers of carbon atoms have the higher melting points and form solid fats.

Fats containing large amounts of the unsaturated fatty acids have low melting points and many of these are liquid at room temperatures. Table XXVIII gives the approximate melting points of some of the common fats.

By holding fats at different temperatures and separating any portion which liquefies, fats can be obtained with different melting points and correspondingly different fatty-acid content and properties. The oleo oil separated in this way from the harder fats in beef suet was formerly used in the manufacture of oleomargarine and contributed in part to the naming of this important table fat.

TABLE XXVIII · *Melting Points of Food Fats*

Fat	Approximate Melting Temperature
	°Fahrenheit
Bacon fat	93
Beef suet	104 to 113
Butter	77 to 99
Hydrogenated lard	113
Hydrogenated vegetable oil	113
Lard	104 or below
Mutton tallow	120 to 124
Vegetable oils	Liquid at ordinary temperatures

Since a solid fat is more easily packaged than an oil and is more satisfactory for many uses, a chemical process has been developed by which hydrogen can be added to the unsaturated components of fats, thus changing them to saturated forms with a corresponding raising of the melting point. This process is known as hydrogenation.

Smoking Temperature. When fats and oils are heated, they do not vaporize or boil like water; but if heated to sufficiently high temperatures, they decompose and give off fumes. The temperature at which this takes place is an important characteristic of a fat, known as the **smoke point** or **smoking temperature.**

Table XXIX gives the smoke points of some of the most used fats and also indicates the amount of free fatty acid present in each. The smoking temperature is important for fats used in frying.

The smoke point of each fat may vary within fairly wide limits depending upon (1) the amount of free fatty acids present, (2) the relative amount of surface exposed to the volume of fat during heating, and (3) the presence of foreign particles in the fat. Table XXIX shows that, in general, the smoke point varies inversely with the amount of free fatty acid present. With the same amount of fat, the greater the diameter of the cooking utensil, the lower the temperature at which the fat will smoke. For frying, therefore, a utensil with a narrow diameter is best. If there are crumbs, flour, and other food particles in the fat, it will smoke at a lower temperature than if these are strained out.

TABLE XXIX · *Smoke Points of Fats*[1]

Fat	Smoke Point	Free Fatty Acid
	°Fahrenheit	*Per cent*
All-hydrogenated fats		
Brand 1	388	.17
Brand 2	439	.06
Brand 3	441	.03
Brand 4	435	.03
Compounds		
Animal and vegetable	390	.12
All vegetable	417	.08
Vegetable and animal	441	.07
Lards		
Steam-rendered, Brand 1	333	.49
Steam-rendered, Brand 2	327	.45
Steam-rendered, Brand 3	343	.27
Kettle-rendered leaf lard	374	.20
Refined deodorized lard	432	.07
Oils		
Peanut	378	.17
Corn	408	.17
Soybean	439	.07
Cottonseed	426	.05

COMPOSITION AND NUTRITIVE VALUE

Many of the food fats, such as the vegetable oils, lard, and the hydrogenated fats, are practically 100 per cent fat. In table fats and in bacon and salt pork (usually classed as fats) water and other nutrients

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[1] Unpublished data from American Meat Institute, Chicago.

Table XXX · *Proximate Composition of Typical Fats*

Name of Fat or Fat Food	Fat	Water	Protein and Carbohydrates	Ash	Fuel Value per Pound
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Calories*
Bacon (uncooked)	64.80	20.20	10.50	5.10	2,836
Butter	81.00	15.00	1.00	3.00	3,325
Hydrogenated fats	100.00	0.00	0.00	0.00	over 4,000
Lard	100.00	0.00	0.00	0.00	over 4,000
Margarine	86.00	10.00	1.00	3.00	3,530
Salt pork (uncooked)	86.20	7.90	1.90	3.90	3,575
Vegetable oils	100.00	0.00	0.00	0.00	over 4,000

present reduce the fat content. Table XXX shows the proximate composition of some of the typical fats.

Energy Value. Weight for weight, fats furnish two and one-fourth times as much energy, measured in terms of calories, as carbohydrates or proteins. Any food fat containing 100 per cent fat furnishes over 4,000 calories per pound. Butter, margarine, and salt pork furnish approximately 3,500 calories per pound and bacon close to 3,000. One tablespoon of any of the food fats supplies from 75 to 100 calories.

Vitamins. Vitamins A and D are present in some fats. Butter contains both these vitamins in varying amounts. The vitamin-A value of butter depends largely upon the vitamin-A content of the cow's feed. Summer butter in general is higher in A than winter butter. Butter varies as a source of vitamin A, ranging from less than 1,400 to more than 27,000 International Units per pound. The vitamin-D value of butter depends not only on the cow's feed but also on the extent to which the cow is exposed to sunlight. The vitamin-D content varies from 40 to 1,800 International Units per pound.

While fats and oils which are used in the manufacture of margarines contain little if any vitamin A, each pound of fortified margarine contains at least 9,000 units of this vitamin, added in accordance with Federal regulation. Many manufacturers now add 15,000 units, thus approximating the average vitamin-A content of butter. Many fats in their natural state contain small amounts of vitamin A. Very little remains in these fats, however, after they have been separated and refined. Fish-liver oils are rich sources of both vitamin A and vitamin D. They are used as concentrated sources of these vitamins rather than as food fats.

Essential Fatty Acids. Some fats are valuable for their unsaturated fatty-acid content. Certain unsaturated fatty acids, including oleic, linoleic, and linolenic, have been found essential for growth, for keeping the skin in a healthy condition, and for preventing eczema. These essential fatty acids may be destroyed by hydrogenation. Notably valuable for their essential fatty-acid content are lard and the commonly used vegetable oils. Even the hydrogenated fats may contain small quantities of these essential acids.

Digestibility. For all practical purposes, fats in moderate amounts are easily and completely digested. Fats are more slowly digested than other foods. They tend to slow down the rate at which the stomach empties, thus delaying the onset of the hunger pangs that come from an empty stomach.

The liquid and soft fats, such as vegetable oils, butter, margarine, lard, and bacon fat, are more readily digested and absorbed than the harder fats. When the melting point of a fat is much above body temperature the fat does not become liquid in the intestine and is more difficult to emulsify and digest. So far as completeness of digestion is concerned, there is little difference among the various fats with melting points below body temperature.

Use in the Diet. Fat is an important source of energy and contributes flavor and a satisfying quality to the diet not obtained from any other nutrient. Fat is essential in all diets as a source of the unsaturated fatty acids required for proper body functioning. Studies of low and high fat diets indicate that fats may improve the utilization of other food nutrients. Some fats, particularly the invisible fats and the table fats, are important sources of the fat-soluble vitamins. Fat is especially useful in high-caloric diets since it increases the energy content of the diet with a minimum change in volume. It adds richness and flavor to bland and bulky foods.

Table fats are spread on breads. Vegetables are seasoned with fat, and fat is added to salad in the form of dressing. As a shortening it makes flour mixtures more tender and palatable; as a cooking medium it both adds and develops flavor.

Inexpensive fats such as salt pork, lard, and margarines are important in adding flavor and increasing the nutritive value of low-cost diets.

SELECTION AND BUYING

Normally, there are many kinds, brands, and qualities of food fats on the market. Most of these are good products, adapted to certain uses. The consumer, however, needs some means of acquainting herself with the different fats and oils and guides to help her in making a wise selection.

Guides to Buying. To help the consumer in the selection of food fats, the following guides may be used in buying them: the label on the package, the inspection stamp, grade marks for butter, brand names, the use which she intends to make of the fats, and the cost.

Package Label. Among the best buying guides for the consumer are informative labels that not only state what the product is and the weight of the contents of the package, but also describe the quality of the contents in terms of a grade.

The Federal Food, Drug and Cosmetic Act requires that labels on edible fats and oils must give sufficient information to enable the consumer to identify the contents of the package, as "corn oil" or "olive oil." All meat fats must carry a label bearing their true names, for example, "pure lard," "refined and hydrogenated lard," or "pure lard with beef fat added." Consumers might expect "Silverleaf Lard" and "Laurel Leaf Lard" to be leaf lards, but they are not. These are brand names.

Inspection Stamp. The Federal inspection stamp (see page 177) on animal fats shows that the product came from healthy animals, was processed under sanitary conditions, and was suitable for human consumption when it left the processing plant. All meat products must be "inspected and passed" to enter interstate commerce. Otherwise, Federal inspection is optional on the part of the processor or merchandiser.

Grade Mark. Butter is the only fat for which the government has set up definite standards of quality. The use of this grading service is optional with the producer or merchandiser. For the consumer it is a guide to quality, since the grades for butter are based on the quality factors—flavor, body, color, and salt. The grades, or scores as they are called, are as follows: U.S. Grade AA or U.S. 93 Score, U.S. Grade A or U.S. 92 Score, U.S. Grade B or U.S. 90 Score, U.S. Grade C or U.S. 89 Score, and U.S. Cooking Grade.

A large amount of butter is graded by the government, but only a comparatively small quantity bearing the government "certificate of quality" reaches the retail market. These certificates are authorized for use in packages of officially graded AA- and A-score butter. They give both the score of butter and the date of grading, and are not necessarily the score at the time of purchase by the consumer. If properly refrigerated, however, this high-score butter should retain its excellent condition for several weeks after grading.

Butter having a score of U.S. 93 ("fine" flavor) or U.S. 92 ("pleasing" flavor) makes up about 20 to 25 per cent of the butter on the retail market. Butter scoring lower than 92 has a more highly developed flavor, and may be preferred by some consumers. Only when all butter is graded and information is available on the quality of each grade will the consumer receive maximum help from the grading service.

Brand Names. Brand or trade names on packages may stand for a certain quality and kind of processing. These also are stated on the package. For labels to be of value in buying, the consumer must read them and understand what the descriptive terms mean.

Intended Use. The use which the consumer intends to make of fat is an important factor in selection. Fats have wide use in food preparation; a fat which is suitable as a table spread may not be suitable at all for frying. Flavor is of first consideration in selecting a spread for bread or a fat to use for seasoning, while smoking temperature is of prime importance when a fat is chosen for frying. If a fat is to be used for shortening, its shortening value should be considered. Frequently, however, one fat will serve more than one purpose.

The uses of fats in food preparation and the properties necessary for each use are discussed on pages 145 to 149.

Market Cost. Cost is important and is frequently a determining factor in the selection of fats, as it is of other foods. Other things being equal, the less expensive fat is advised.

The price of the various fats depends in part upon the original cost of the fat, and in part upon the cost of the processing involved. In normal times supply and demand also play an important role in the price of fats and oils, as of other foods.

Because of the many and varied factors affecting the market price of fats and oils, it is difficult to make definite statements regarding their comparative costs. It would be well to make a study of the comparative cost of fats in the laboratory. In general, however, margarines are less expensive than butter; lards are slightly less expensive than hydrogenated fats; and olive oil is more expensive than the other oils. Of the vegetable oils, olive is the least expensive to produce but supply and demand keep it high in price. The olive oil produced in California, though limited in amount, is less expensive than imported olive oils. Accurately labeled mixtures of olive oil with other oils are available at lower cost than pure olive oil.

The price per unit of any kind, quality, or brand of fat depends upon the following points: (1) whether it is purchased in bulk or in package form, and (2) the size of the unit purchased. Lard and compounds (see page 143) often may be purchased in bulk at lower cost per unit than in cartons or other containers. They also may be purchased in various-sized cartons and containers. Usually, the larger packages mean lower cost per unit. In buying packaged fats the amount stated on the label should be used to determine cost in relation to content. The Federal Food, Drug and Cosmetic Act requires every package of food sold in interstate commerce to carry an accurate statement of the weight or volume of the contents.

Fats are usually marketed by weight in cartons, pails, or cans, each containing a certain number of pounds or fractions of a pound. Butter may be purchased by the pound or by fourths of a pound; margarines are sold in pound cartons; lard and compounds in one-pound, two-pound, three-pound, four-pound, and five-pound containers; and hydrogenated fats in one-pound to five-pound containers.

Oils are marketed in bottles and tins. Bottles are used more extensively for olive oil than for other kinds. They may contain from two, three, or four ounces up to a pint or a quart. Oils are available also in half-pint, pint, quart, half-gallon, and gallon tins. On the wholesale market, some oils are available in five-gallon cans.

Nutritive Value. The energy value is approximately the same for the different food fats and oils. Those containing less than 100 per cent fat, of course, will furnish fewer calories than those which are all fat. (See Table XXX.)

The different food fats vary in their vitamin-A content and in the amounts of unsaturated fatty acids which they contain. (See page 137.) Since these nutrients are essential to growth and health, these facts should not be overlooked when fats are selected.

Manufacture of Fats. In order for the consumer to make a wise selection of fats she should be familiar with the different kinds, know what they are made from, and how they are processed.

BUTTER. Butter is milk fat which is separated from cream by mechanical agitation, called "churning." It contains, in addition to butter fat, a small proportion of the natural milk constituents and some water. If sold in interstate commerce, it must contain at least 80 per cent milk fat.

Butter may be made from either ripened or sweet cream. The addition of coloring and salt is optional. Sweet-cream butter is sold both salted and unsalted.

Process or renovated butter is available in some markets. It is usually made from butter of inferior quality treated to remove undesirable odors and flavors and rechurned in fresh milk and cream. It must be labeled "Process Butter" or "Renovated Butter," and usually is sold in bulk, at a lower cost than butter.

MARGARINE. Margarine is a high-quality table fat made from refined food fats other than butter fat and churned in pasteurized skim milk to form a product with characteristics similar to those of butter. Salt is optional. Coloring is forbidden by law except on payment of Federal or State tax or both. By Federal definition margarine must contain 80 per cent fat. The fats most commonly used in the manufacture of margarines are cottonseed oil, soybean oil, corn oil, peanut oil, coconut oil, and meat fats. A blend of hydrogenated and unhydrogenated oils gives proper consistency.

An old law required that margarine, originally made from beef fat, be labeled oleomargarine because the liquid portion of beef fat that was formerly used in margarine manufacture is known as "oleo oil." This law has never been changed although vegetable oils have largely replaced meat fats in the manufacture of margarines.

The manufacturer of margarine is required to pay a Federal tax of one-fourth cent a pound for uncolored, and ten cents a pound for colored margarine. In addition, the government imposes an annual license fee of $600 on the manufacturer of margarine. The wholesaler must pay a license fee of $480 to sell colored and $200 to sell uncolored margarine; and the retailer, $48 a year to sell colored margarine and $6 to sell uncolored. Some states have additional taxes on margarine. This explains why the consumer usually colors her own margarine. Uncolored margarine is usually packed with a pellet or capsule of coloring or with a small packet of powdered coloring.

Restrictive laws require public eating establishments that serve margarine for table use and color it themselves to pay the yearly manufacturer's license fee of $600 plus an excise tax of 10 cents a pound on the margarine they color. These laws do not apply to public eating places using margarines in cooking.

LARD. Lard is the fat rendered from the fatty tissue of hogs. Lard may be smooth or slightly grainy, depending upon the manufacturing treatment. Each 200-pound hog produces about 30 pounds of lard. Lard is classified according to the part of the animal from which the fat is taken and the method of rendering it.

Steam-rendered lard makes up most of the lard on the market. It is made from fat stripped from the internal organs at the time of slaughter and from trimmings from the various market cuts, and is prepared by heating the fatty tissue in a closed tank with 30 to 60 pounds steam pressure (275° to 310° F.). Before being placed on the market, this kind of lard is clarified by filtering. It may also be bleached, although the trend is away from bleaching. It is cooled rapidly, the cooling producing a very smooth texture.

Kettle-rendered leaf lard is produced in limited amounts. It is made from "leaf fat," the white internal fat, exclusive of that adhering to the intestines. This is the hardest fat on the animal. Leaf lard is rendered in an open kettle at low temperature, 230° to 260° F. It is light in color, slightly grainy owing to slow chilling, with a firm texture, and has a mild and pleasing flavor and good keeping qualities.

Dry-rendered lard is becoming more important commercially than kettle-rendered, being accepted now on the Board of Trade. This is similar to kettle-rendered lard except that it is rendered in a closed container in a vacuum to prevent the contact of oxygen with the fat. It is usually rendered in a cylindrical tank in which the moisture is boiled off and nothing is left but the lard and fiber. Then the fiber is strained out of the lard.

Hydrogenated lards are marketed in limited amounts under trade names. Hydrogen is added chemically, making a totally different product, with a higher melting point than the lard had originally. The lard is also deodorized. The deodorization raises the smoke point by removing the free fatty acids. Small amounts of materials to improve keeping quality and preserve the bland flavor sometimes are added. Although the smoking temperature is raised and the creaming quality improved, the shortening value of the lard is decreased by hydrogenation. In decreasing the amount of the essential unsaturated fatty acids present, there is some loss in nutritive value.

Deodorized lard may now be purchased under a trade name. It is a lard from which free fatty acids have been removed to raise the smoking temperature; a small amount of hydrogenated lard has been added to raise the melting point. This lard has been steam-deodorized to remove flavor and odor. An antioxidant has been added so that the lard need not be kept under refrigeration. It is available at present in one-pound cartons and three-pound cans.

Other lards made and marketed in limited amounts include neutral and drip-rendered lards.

Neutral lard is rendered at a very low temperature, about 120° F., from leaf fat or leaf and back fat. It is a lard of very low flavor and odor. It is used in margarine manufacture.

Drip-rendered lard is prepared by rendering the fat in a tank similar in principle to a drip coffee pot. The fats, after being hashed, are heated under vacuum in the upper chamber of a double tank, and as the lard is rendered it drips through a perforated plate into the lower chamber, where it is bleached with activated carbon, neutralized with sodium bicarbonate, and dried. The resulting lard is almost "water-white," with little taste and odor, and of high smoking temperature, frequently above 400° F., due to its low free-fatty-acid content. It is sold under brand names.

Compounds. A compound is any mixture of animal fats, or vegetable fats, or animal and vegetable fats. They are mixtures of hard and soft fats blended to form a plastic consistency comparable to lard and hydrogenated fats. The label must show which types of fats predominate.

Hydrogenated Fats. Hydrogenated fats are marketed under a variety of trade names. They are refined, bleached vegetable oils, normally liquid at room temperature, which have been solidified to a plastic state by the addition of hydrogen. They then are deodorized. They are whipped or aerated to give additional plasticity and creaming quality, and to make them appear whiter. Hydrogenated fats are of smooth texture and of more bland flavor than natural unrefined fats.

Vegetable Oils. Vegetable oils or salad oils are available by the name of the source of the oil from which they are made or under trade names with a designation of the source of the oil.

Corn oil is expressed from the germ of the corn grain; **cottonseed oil** from the crushed seeds of the cotton plant; **olive oil** from ripe olives. The highest quality of "virgin oil" is the first oil expressed under light pressure, and is unrefined. Most olive oil on the retail market is the result of heavy pressure plus further treatment. Olive oil may not be blended with other oils unless so labeled. **Peanut oil** is expressed from ground peanuts; **soya oil**, from soybeans. Refined and deodorized soya oil is sold for salad oil.

Amounts and Kinds to Buy. In buying table fat, fat for frying and shortening, and oils for salad dressing, the amounts to be purchased at one time depend upon a number of factors. These include: (1) the dietary needs of the family; (2) the use made of fat in food preparation; (3) suitable storage space in relation to the keeping quality of the fat; and (4) the amount of money saved by quantity purchase.

The choice of fats from those available on the market depends in large measure upon the uses to which they will be put, personal taste, and food budget.

CARE AND STORAGE

The properties of fats, like those of other foods, determine how they should be cared for and stored. Fats and foods rich in fat are unstable and deteriorate rapidly unless properly handled.

Causes of Deterioration. There are at least four causes of deterioration of pure fats and fat-rich foods. These are discussed below.

Absorption of Odors. Any pure fat or food rich in fat, as egg yolks, cream, butter, and fat meat, may absorb odors from other foods stored near them. They also take on such foreign odors as those from spoiled food and from paint.

Oxidation. Unsaturated fats and oils readily take up oxygen when exposed to the air. Oxidation is probably the most important factor in the production of rancidity in processed fats. The conditions known to prevent oxidation are these: (1) exclusion of air, (2) exclusion of light, and (3) low temperature.

Enzyme Action. The action of lipase, an enzyme which splits fat, develops an objectionable odor and a soapy flavor in foods of high fat content stored at too high a temperature. Low temperatures retard this action. Cooking will stop it altogether, since lipase, like other enzymes, is destroyed by heat.

MICROORGANISMS. Bacteria and molds do not grow in pure fat to cause spoilage, but many foods rich in fat, with moisture and other constituents present, spoil from a growth of these microorganisms. Butter, margarine churned in milk, and fat meats are subject to such spoilage.

Low storage temperatures retard this type of spoilage. Cooking of those fat-rich foods which can be cooked also delays spoilage.

Refrigeration. To prevent deterioration, all fats and foods high in fat should be refrigerated at 50° F. or below. Possible exceptions to this general rule are the hydrogenated and stabilized fats and oils. Fats are of better consistency and the table fats have better flavor if stored at not too low a temperature.

Some of the oils solidify in the refrigerator. This does not impair their quality in any way, but they may be used more conveniently if removed from the refrigerator in time to allow them to liquefy.

Practical Points on Care. In general, fats should be covered closely to keep out light and air and to prevent the absorption of odors, then stored in the container or package in which they were purchased.

For best keeping, meat drippings, kitchen-rendered fat from fat meats and trimmings, and fats which have been used for frying should be brought to a low moisture content and strained through cloth to remove any food particles before storing. Store these left-over fats as carefully as any of the commercial fats, since they are valuable in many ways in food preparation.

When fish, onions, or other strong-flavored foods have been fried in deep fat, slices of potato may be cooked in the fat to remove these flavors.

In using a solid fat from a large container it is better to remove it evenly from the top, rather than to dig down in the center or at the sides. This latter method exposes more surface to the air than when the top is taken off evenly. For this reason, a tall, narrow container is better than a short wide one.

Kitchen-rendering. The consumer should make sure she receives all the fat trimmings she pays for with her meat cuts. These trimmings from uncooked meat should be kept covered in the refrigerator until it is time to render them. For rendering, trim all lean from the fat and chop the fat fine or grind it. Render by heating slowly in a double boiler on top of the range or in a slow oven (200° to 250° F.). Strain and store as other fats for use in cooking.

Save the pieces which are strained out. These are called "cracklings" and may be used in muffins or corn bread.

Cured pork rinds may be rendered without grinding.

USES IN FOOD PREPARATION

Fats and oils have wide use in food preparation. The principal uses are these: (1) to add richness and flavor to foods, (2) to cook or fry foods, and (3) for shortening flour mixtures. Fats also are used for greasing pans to prevent foods from sticking during cooking. Though some fats serve more than one of these purposes no single fat is equally suitable for all uses.

For Flavor. Flavor is of first consideration when fats or oils are used as a spread for bread, as an ingredient of salad dressings, or as seasoning for vegetables. Choosing from among the different kinds of fats, however, is largely a matter of personal taste, customary food habits, cost, and availability.

As spreads, butter and margarine are the fats most commonly used. For salads, olive oil, with its characteristic flavor, and cottonseed oil, corn oil, and peanut oil, with their bland flavor, are those most preferred. In certain salad dressings, butter, margarine, or bacon fat may be used.

For seasoning vegetables, butter, margarine, bacon fat, salt pork or ham drippings, chicken fat, and olive and other vegetable oils are used according to preference and cost. In this country it is customary to "butter" vegetables, though margarine may be the fat used, while in Italy the richness and flavor would come from olive oil. Meat fats, chicken fat, butter, and margarine are used in many sauces.

For Frying. There are two general types of frying. In one, the food is cooked in shallow fat; this is referred to as frying or pan-frying. It is also called sautéing when only enough fat is used to prevent sticking. In the other type of frying, the food is cooked by immersing it in fat. This is called deep-fat frying. The advantages of these methods of cooking are that practically no food nutrients are lost and flavor is developed by browning.

Good flavor is desirable when fat is used as a cooking medium, but of greater importance is the amount of heat which the fat can stand before it smokes. When fat smokes it is breaking down chemically. If the heating is continued at the smoking temperature the glycerol (glycerin) is decomposed to form acrolein, a substance irritating to the nostrils. If acrolein is absorbed by a food cooked in the fat, it is also irritating to the digestive tract.

In both pan-frying and deep-fat frying the object should be to cook the food through and brown the outside, with the minimum absorption of fat. There are several factors affecting the amount of fat absorbed. Among them are these: (1) the temperature of the fat, (2) the length of time the food is in the fat, (3) the amount of surface exposed, and (4) the nature of the material being fried.

The temperature of the fat should be high enough to cook the outside of the food so quickly as to prevent fat absorption but not so high as to bring about decomposition of the fat. The longer the food is in the fat and the greater the amount of exposed surface, the greater the fat absorption. The use of coatings such as egg, or batter containing egg, lessens the amount of fat absorbed. In such products as doughnuts, decreased sugar, liquid, and leavening decrease the absorption of fat during frying.

The temperature for frying depends upon the size of the pieces and the condition of the food to be fried, that is, whether it has been precooked or is uncooked. When cooked foods are fried it is necessary only to heat through and brown them. In the case of croquettes made from left-overs a higher temperature can be used than with uncooked food.

With doughnuts and uncooked food products coated with egg or batter, a lower frying temperature is necessary to cook the food through before it becomes too brown. The lower temperature may be used without undue fat absorption if the coated foods are permitted to dry somewhat before being immersed in the fat.

No food needs a deep-fat frying temperature higher than 385° F. and most foods can be fried successfully at temperatures considerably below this. It will be seen by studying the smoke point of various fats (p. 138), that hydrogenated fats, compounds, high-quality lard, and vegetable oils, with the exception of olive oil, may be heated sufficiently high for deep-fat frying. Flavor and cost of these fats, therefore, are the main points to be considered in making a choice.

For frying potato chips and other foods to be served cold, fats which are soft or liquid at room temperature give more luster to the products than fats with higher melting points. (See Table XXVIII on page 138.) Olive oil, butter, and margarine are not suitable for deep-fat frying since they smoke at too low temperatures. It must be recognized, however, that free fatty acids soon develop in fat used for deep-fat frying, thereby lowering the smoking point. Therefore, by repeated use of the fat, an initially high smoke point often is brought down to a point that is unsatisfactory for frying.

The use of a thermometer is advised to assure correct deep-fat frying temperatures. Without a thermometer, the time required to brown a one-inch cube of bread in the hot fat can be used as a guide. Table XXXI states the approximate temperatures for deep-fat frying and the approximate time required to brown a cube of bread at the various temperatures.

Table XXXI · *Temperatures for Deep-Fat Frying*

Food Product	Temperature of Fat	Approximate Time to Brown One-Inch Cube of Bread
	°Fahrenheit	*Seconds*
Doughnuts, fish, shellfish, fritters	350 to 365	60
Coated vegetables and croquettes	375	40
French-fried potatoes and potato chips	375 to 385[1]	30 to 40

The choice of a fat for pan-frying or sautéing is not limited to those with a high smoking point, since cooking by these methods may be carried out at lower temperatures than are successful for deep-fat frying. Meat drippings, all kinds of lard, hydrogenated fats, butter or margarine, and the vegetable oils may be used, but the fact must not be overlooked that these fats are not all alike in the amount of heat they can stand. Flavor, cost, and availability are the main points to be considered.

For Shortening. When fat is used for shortening flour mixtures, such as pastry, quick breads, yeast breads, and cakes, its purpose is to make the product tender and, in some cases, to make it flaky also. These various products differ in texture and desired flavor and therefore may require somewhat different qualities in a fat.

The differences in the shortening value of fats are most important in pastry and in products with a similar texture, such as biscuits and shortcake. When fat is used for shortening, it makes the product tender by surrounding the gluten and starch particles of the flour and lessening their adhesiveness. The most tender pastry is the one in which the fat surrounds the greatest surface of gluten and starch particles, adheres to them, and is not squeezed out by pressure. There are several factors working together which affect the amount of surface area covered and the extent to which the fat adheres to the flour particles, or, in other words, the shortening power of a fat. These include: (1) the amount of fat in the mixture, (2) its degree of unsaturation, (3) its plasticity or ability to be worked, and (4) the other ingredients used and the method of combining them.

In general, the more fat used or the greater its concentration in a mixture, the greater the shortening effect. Other factors being equal, products which are 100 per cent fat have greater shortening value than products containing 80 to 85 per cent fat. On the other hand, the same fat concentration in a flour mixture does not always give the same shortening value.

Deep-Fat Frying · In deep-fat frying a thermometer is required to assure correct temperature

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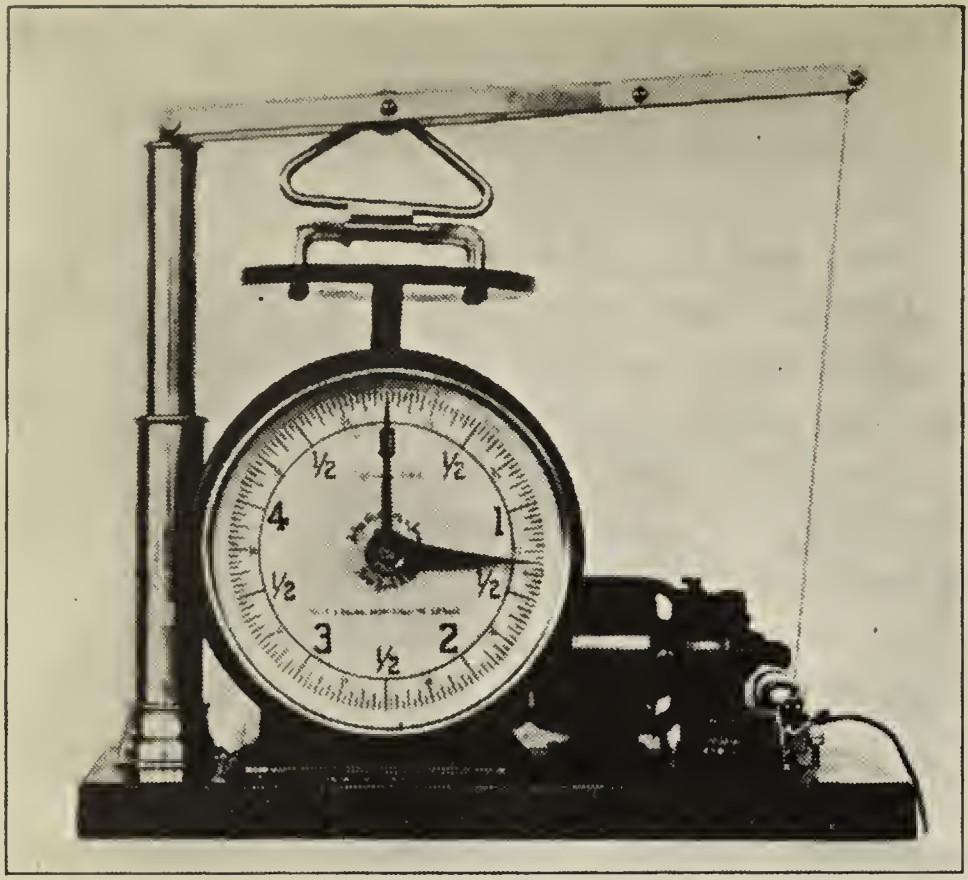
[1] Varies with the potato, size of pieces, and method of frying.



American Meat Institute

Bailey Shortometer · This instrument is used to determine the weight required to break pastry made from different kinds and amounts of fat. This weight is a measure of the tenderness of the pastry and the shortening value of the fat used

The degree of saturation of a fat seems to affect its shortening value, especially when that fat is used in pastry and similar products. It is quite apparent that some of the unsaturated plastic fats produce the most tender flaky pastry, biscuits, and shortcake.

While oils contain a high proportion of unsaturated fats, they do not have as high shortening value as lard, which is plastic as well as unsaturated.

The temperature of a fat affects its plasticity (the plasticity of the hard fats is lessened at low temperature); yet there is something other than temperature which determines plasticity. Lard and a few other fats are plastic over a wide range, from refrigerator temperature to high room temperature. Table XXXII gives the shortening power of some of the fats most used for shortening purposes. The values of various shortenings have been determined by the use of the shortometer. This is an instrument for measuring (by weight) the breaking or crushing strength of a sample of pastry or cooky of definite size and thickness made under carefully controlled conditions, as to formula, method of mixing, temperature, rolling and cutting procedure, etc. The figures in this table explain the good results which lard gives in pastry and similar products. A fat of low melting point with a low degree of saturation, and at the same time a high degree of plasticity, seems to give the most tender flaky pastry. Oils make tender pastry, but the product has a mealy rather than the flaky texture produced by a plastic fat. Also, the pastry made with oil may be somewhat oily to the touch and taste.

In cakes and similar products, other ingredients, their concentration and the method of combining, as well as the shortening value of the fat, affect the tenderness of the product. For example, sugar increases the tenderness of cakes; and creaming the fat with the sugar or flour or both results in a more tender product than when the fat is melted. Fats with good creaming quality, as well as desirable or bland flavor, are best for cakes. Such fats include butter, margarine, hydrogenated fats, and mild-flavored highly refined lards.

TABLE XXXII · *Relative Shortening Value of Fats*[1]

Fat	Shortening Value
Lard, 9 brands, 10 samples	100
Hydrogenated lard, 2 brands	78–81
Hydrogenated vegetable-oil shortenings 2 brands, 5 samples	75–85
Compounds, 3 brands	74–82

For greasing pans, the mild-flavored 100 per cent fats are best, since they form a continuous film. Butter and margarine contain some protein, which coagulates on heating and may cause sticking to the pan.

In deciding the comparative economy of the various fats used for shortening, not only the cost per pound but also the shortening power should be considered. The shortening power of fat influences the amount of the fat needed for a certain degree of tenderness.

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[1] Unpublished data from American Meat Institute, 1937–1945.

Substituting Fats. It is frequently necessary to substitute one fat for another in a recipe. In many cases, measure for measure or weight for weight of various fats cannot be used, especially for shortening. The amount of actual fat in a cupful or half pound is not the same for all fats. (See page 139.) Neither is the shortening power the same.

In general, butter and margarine may be substituted one for the other, but when one of the 100 per cent fats is used in place of butter or margarine, not over seven-eighths as much by measure is needed; when lard is used, only about three-fourths as much. When the change is the other way round—butter or margarine substituted for a 100 per cent fat—at least one-eighth more by measure of butter or margarine is needed.

Some hydrogenated fats whose bulk has been increased by the incorporation of gas may be used measure for measure in place of butter. When hydrogenated fats are substituted for lard, an additional $1\frac{1}{2}$ to 2 tablespoons for each cup of lard designated should be used. When an unsalted fat is used in place of a salted one, additional salt is needed.

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XI · Frozen Desserts

A popular group of American desserts are the frozen mixtures: ice creams, mousses, ices, and sherbets. Of these, by far the most popular is ice cream. This is due to the pleasing flavor and texture of this popular food and the ready availability of commercial ice creams of good quality.

Holmes,[1] in an article on the nutritive value of ice cream, estimated that nearly half a billion gallons of ice cream were consumed in the United States during 1943. Ice cream is an important source of riboflavin and carotene in the diets of this country. With wider use of fresh and frozen fruit products in flavoring, ice creams can be made to contribute important amounts of vitamin C.

The rapid technological developments in ice-cream making in recent years have improved the commercial product and so increased its availability that ice-cream making has been almost completely taken over from the home by industry. Still some homemakers prefer to make their own, especially in farm areas where they have "the makings," and lack ready access to the commercial product.

QUALITY IN ICE CREAMS

An understanding of the factors that give quality to frozen desserts is important in the selection of the commercial product, and useful in understanding the basic proportions and methods used in the home preparation of these desserts. Flavor, body, and texture are important elements in the quality of ice cream.

Flavor. The flavor of the ice cream depends first of all on the cream which forms the basis of the mixture. It should be free from any unpleasant flavors and not too acid. There should be enough fat to give the expected body and texture, for these are factors in flavor; but too much fat makes a mixture too rich to be palatable. It has a buttery texture that detracts from flavor.

Other materials added, such as eggs, dried or evaporated milk, gelatin, and flavorings, must be selected with the same care as the cream. Inferior flavor in any of these will detract from the flavor of the mixture. The addition of a small amount of salt brings out the flavor of the combined ingredients.

Slightly more sugar and flavoring are required in frozen desserts than in similar mixtures used unfrozen, since at low temperatures the taste bulbs do not respond to the taste stimulae at the same concentration. About 14 to 16 per cent of added sugar by weight is the amount preferred. An excess of sugar is to be avoided since it not only is objectionable to the taste, but may lower the freezing point of the mixture too much. Sugar in the right amount adds to flavor and improves the body and texture of the frozen cream. Granulated sugar (sucrose) is the form most frequently used. The less sweet glucose and cerelose may be used to replace some of the sugar. These must be used in larger amounts than granulated sugar to give comparable sweetness. Both lower the freezing point more than sucrose, and a lower temperature for hardening and service may be required. Honey may be used for both sugar and flavor but it also lowers the freezing and melting points more than sucrose.

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[1] Arthur D. Holmes, "Ice Cream as a Source of Riboflavin, Carotene and Ascorbic Acid," *New England Medical Journal*, Vol. 234, p. 47, 1946.

Various flavorings are used in ice creams. Vanilla is by far the most popular. Just enough should be added to kill any flatness of the cream-sugar mixture, but not enough to cover the natural flavor of the cream. Chocolate is second in popularity. It should be cooked smooth in a portion of the mixture and added to the remainder. Cocoa gives better results than chocolate. Not more than two and one-half per cent by weight should be used. Semisweet chocolate in the form of "chips" or coarsely grated is added to some creams. This carries the chocolate flavor and gives a special texture to the mixture. Coffee, caramel, and maple are among the other flavors used. The latter two are frequently combined with nuts.

Crushed fruits, fresh, frozen, or canned, candied fruits, and nuts are used alone or in combination with other materials to flavor ice-cream mixtures. Fruits and nuts contribute to the food value as well as to the flavor. Wider use of fruits in flavoring ice creams offers a means of increasing the consumption of fruits with their desirable flavors and nutrients, and provides a channel for distribution of fruits which would otherwise be wasted. Fruits graded low for shipping or canning because of size, slight imperfections, and ripeness are often of superior flavor and food value. These go to waste in the field unless processed immediately. The newer methods of freezing and canning these products in purée form make it possible to preserve this fruit with much of its fresh flavor. The use of these products in frozen desserts will add not only flavor but valuable nutrients to the diet.

Body. Body in ice cream is the consistency or apparent richness of the basic mixture. A cream with good body has melting resistance. Both body and melting resistance are dependent on the amount of fat, on the aging of the cream, which increases its thickness or viscosity, and on other materials present either in solution or in suspension in the cream. These other materials added to creams of low fat content to give body are called "fillers."

The fillers most used by the manufacturers of ice creams are milk solids in the forms of dried and evaporated milk. The amount of either that can be used is limited, since lactose, which is less soluble than other sugars, tends to be thrown out of solution when the concentration of the nonfat milk solids reaches 12 per cent. This causes what is known as "sandiness" in the finished ice cream. This condition is especially likely to occur when frozen mixtures are held at very low temperatures or for too long a time.

Eggs, dextrins, starch, and ground cereal products also may be used as fillers. These fillers increase the amount of material in solution and in suspension in the cream, and the body of the mixture is improved.

Most fillers also increase the viscosity of the mixture, and the amount of air it can hold. Air beaten into such mixtures increases the apparent richness and the volume obtained from a given measure. The requirement that a given measure of ice cream have a minimum weight is a check on the amount of air that is allowed.

Texture. It is difficult to separate the ingredients of ice cream that contribute to body and texture since they are closely related. The fat content and certain fillers that give body also contribute to texture. Texture depends upon the size, shape, and arrangement of the ice crystals and any other materials suspended in the mixture. A smooth texture is desired. Coarse, icy crystals or flakes, sandiness, and a buttery feeling all contribute to poor texture.

Initial smoothness is largely determined by the body of the mixture. Substances in solution such as sugar, which increases the viscosity of the mixture, improve the texture by decreasing the amount of ice formed. The amount and fineness of division of the solids present, other than those in true solution, contribute to smoothness by interference with the formation of large crystals. The most important of these is fat. The finer the emulsion of the fat the more satisfactory it is in making the frozen cream smooth. This explains the good results from homogenized cream. With other materials the same is true. The finer the division of the particles, the more effective they are in controlling crystal formation and in making an ice cream that is initially smooth. But in commercial ice creams, initial smoothness is not enough. Supplies must be held for varying periods of time at low temperatures. It is important that this be done without loss of initial smoothness. This resistance of a frozen mixture to change in texture, when held at low temperatures, is called stability.

Stability of the ice cream depends upon the permanence of the suspension of the materials that give body and texture. It is aided by the addition of substances which increase the viscosity of the mixture, and so tend to prevent the separation of the fat globules and any other colloidal particles suspended in the cream. This is sometimes referred to as "binding" frozen mixtures.

Gelatin and vegetable gums used to stabilize or bind these mixtures are called stabilizers. These stabilizers increase the viscosity of the mixture, help to hold any particles in suspension, and so retard the development of large crystals.

Most commercial ice creams have three tenths to five tenths of one per cent of these or other stabilizers added for this purpose. A small amount is useful; more than one half of one per cent is objectionable, and may be looked upon as an adulterant.

Also important in determining the texture of ice cream and other frozen mixtures is the method of freezing. In obtaining a smooth frozen product, the temperature of freezing, the amount of air incorporated during freezing, and the rapidity of freezing are all factors. These will be discussed later.

FRUIT ICES

Ices are popular as homemade desserts and serve as a useful and palatable means of adding the nutrients in fruit to the diet. The development of methods of holding fruit pulp frozen and canned has stimulated their use in ices as well as in ice creams. The increased use of natural fruit juice and pulp to flavor commercially prepared fruit ices has improved the body and texture of these ices as well as their food value.

Flavor is specially important in ices. They should be stronger in flavor than mixtures to be used without freezing. Lemon juice seems to accent the flavor of other fruit juices, so that regardless of the predominating fruit flavor, the addition of a small amount of lemon improves any flavor except those of very acid fruits. Salt in small amounts improves the flavor of fruit ices. The texture is determined by the amount of solids in the mixture, the use of gelatin or a vegetable gum to stabilize, the temperature of the freezing solution, and the amount of air incorporated during freezing.

Plain ices are prepared from fruit juices and pulp, water, and sugar, and when frozen with rapid stirring have a reasonably smooth texture. The texture is improved by the use of a stabilizer like gelatin. A sherbet is an ice to which beaten egg white has been added, or in which milk or cream has replaced all or part of the water. Sherbets have more body and are smoother than water ices. Gelatin also may be used in sherbets.

METHODS OF FREEZING

In freezing, heat must be absorbed from the mixtures to be frozen. This is accomplished by surrounding them with cold brines. Low-temperature brines are obtained by the melting of ice, or the changing of a volatile liquid to a gas. Household methods of freezing are simple and will be discussed first.

Household Freezing with Ice. Heat is given off when water changes from a liquid to a solid, or freezes. When the ice melts or changes from a solid to a liquid it must absorb an equal amount of heat.

In the home, use is made of melting ice in freezing. Under ordinary conditions, melting ice has a temperature of 32° F. By the addition of salt to ice, the rate of melting can be increased and the temperature reduced. The temperatures obtained are in direct proportion to the weight of salt added to a given weight of ice.

Household freezers for making frozen desserts are available in convenient sizes and at various costs. They consist essentially of an outside container, preferably of some non-conducting material such as wood, in which the freezing mixture is placed. Into this is fitted another container made of metal, a good conductor of heat, in which the material to be frozen is placed. This is provided with a dasher connected with a handle, so that the mixture can be stirred while freezing.

Ice and salt in varying proportions are used to form the freezing mixture. Ice absorbs a definite amount of heat for every unit of weight melted. The temperature of the brine formed depends upon the rapidity of the melting. As the proportion of salt to ice is increased, the rate of melting increases and the temperature of the brine is lowered correspondingly. Mixtures of approximately one part salt to six parts of ice, by weight,

A Typical Household Freezer

U.S.D.A.

U.S.D.A.

Equipment for Freezing Special Desserts · Mousses and parfaits are frozen without stirring. These mixtures may be sealed in watertight molds and buried in ice and salt to freeze

yield most satisfactory results in freezing ice creams. One part salt to four of ice is preferred for ices and sherbet.

The cold brine is in contact with the outside of the container in which the mixture to be frozen is placed. If left undisturbed, the mixture will freeze around the sides of the container. The temperature is coldest there, and large crystals will form while the center of the mixture remains unfrozen. For this reason freezers are constructed with dashers to keep the mixture stirred and so promote more even freezing.

On one side of the dasher is a sharp-edged knife. As the dasher is turned in the freezer, this knife removes the crystals from the side as fast as they are formed and allows an unfrozen portion of the mixture to come in contact with the cold surface. This both decreases the time required for freezing and helps to keep the crystals small.

The dasher accomplishes another purpose. On the other side is a beater which forces air into the mixture as the dasher turns. Rapid turning, especially in mechanical freezers, increases the amount of air beaten in. The amount of air held in the mixture depends upon the viscosity of the mixture. The viscosity of any mixture increases as the temperature is lowered. The rapid turning of the dasher is of maximum advantage when the mixture reaches almost the freezing temperature. At this point, even in a hand-operated freezer, volume can be materially increased by the air incorporated when the dasher is turned rapidly. In household freezing, effort is saved if the dasher is turned slowly until the mixture is thoroughly chilled, then rapidly until the mixture is frozen. When it is frozen, the dasher is removed and a cork inserted in the hole left in the top. This prevents the entrance of brine. The freezer is then packed with more ice and salt (8 parts ice to 1 of salt), covered with some nonconductor of heat (newspapers will serve), and put away to harden for about two hours.

Desserts Frozen without Stirring. Certain frozen desserts, mousses and parfaits, have always been frozen without stirring. These are rich mixtures using fairly high proportions of heavy cream and egg white. In their preparation, air is incorporated by whipping either the cream or the egg white. The cold mixtures are placed in containers sealed with a strip of cloth dipped in paraffin and packed in ice and salt (1 part salt to 4 of ice). Freezing will require about four hours. It may be necessary to drain off any excess brine and add more ice and salt to complete the freezing. For this reason, wooden tubs for packing these desserts are provided with an outlet for draining.

Frozen puddings and molded ice creams are usually first frozen with stirring in a freezer and then placed in molds, sealed, and packed in ice and salt to harden. Frozen puddings have candied fruit, nuts, and whipped cream added before they are placed in molds and packed to harden.

Mechanical refrigerators are equipped with trays in which desserts can be frozen. These trays have no device for beating the mixture. The most successful desserts for freezing without stirring are the mixtures in which air can be incorporated in advance of freezing, as in mousses and parfaits.

When less rich ice creams and ices are frozen in these trays, their consistency is improved if the partially frozen product is removed from the tray to a chilled bowl and beaten rapidly to break up the crystals and incorporate air. They should be prepared from mixtures with considerable body.

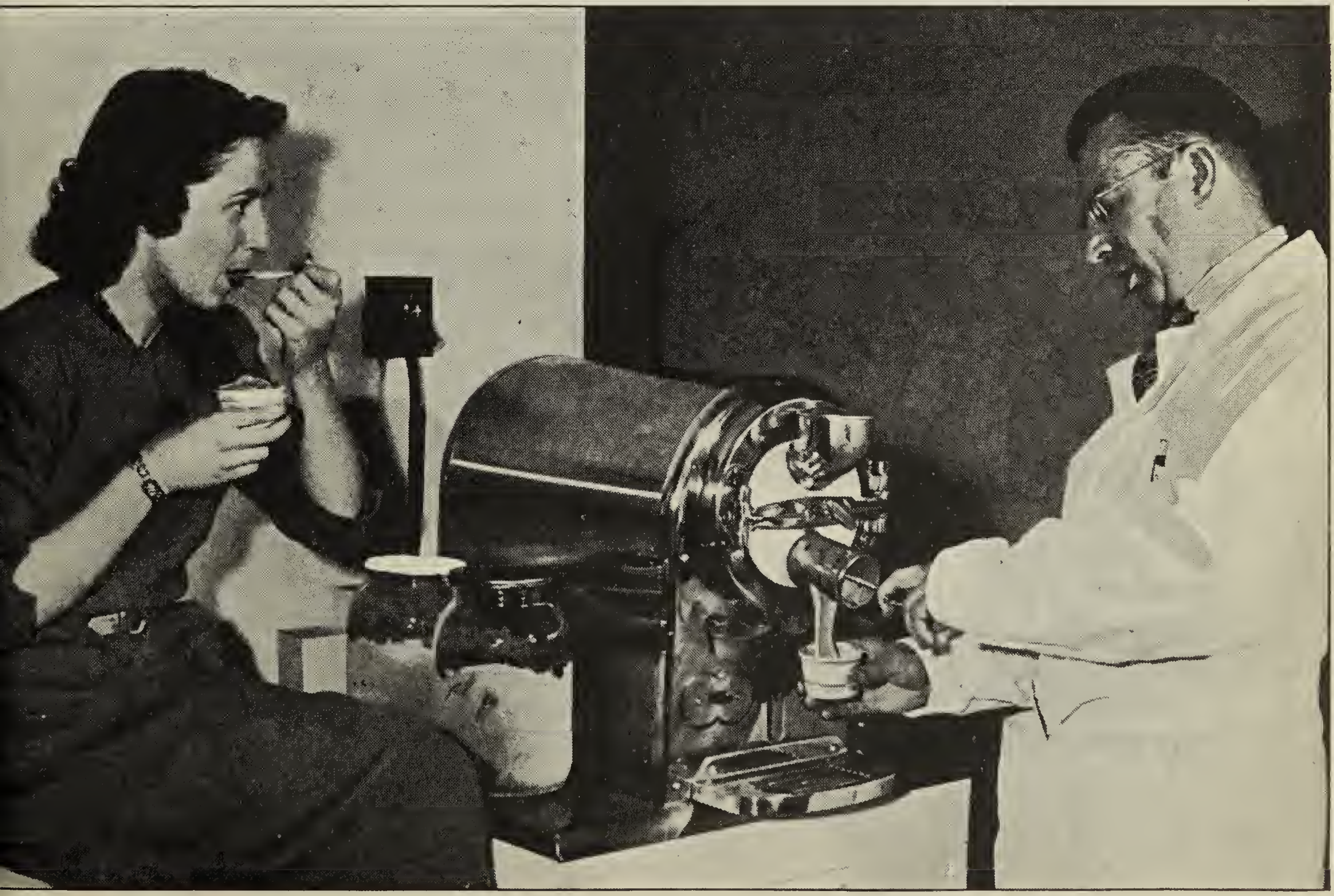
Commercial Freezing. Commercial freezing is completely mechanized. There is a continuous flow of brine at controlled temperatures about the freezer. These brines are not cooled by melting ice, but by the change of an easily volatilized liquid to a gas. This requires heat and takes it from the brine, which can be reduced to the temperature desired. The dasher is mechanically operated and can be run at desired speeds. Hardening rooms are available at standard temperatures to complete the freezing and hold the product.

The steps in commercial freezing are the same as in household freezing. The mixture is frozen in a mechanically turned freezer cooled with brine at about 27° to 29° F. until a thick, slushy consistency is obtained. During this stage air is beaten in. The ice cream is then drawn off into cans or molds and hardened in a room held at about 0° F. The beating in of air, because of its influence on crystal formation, increases the smoothness, the apparent richness, and the volume obtained from a given weight of mixture.

"Overrun" or "swell" is the name given to the increase in volume which results from the incorporation of air during freezing. The factors which determine the amount of overrun are the viscosity of the cream, the temperature of the ice cream when drawn from the freezer, amount and kind of fillers and binders used, and the temperature of the brine. The overrun may be as much as 150 per cent. Overrun in excess of 90 per cent

Commercial Freezer · The partially frozen mixture is drawn off into cans or cups and transferred to rooms held at 0° F. to harden

U.S.D.A.



should be avoided. This is controlled in ice-cream specifications by the requirement of a definite weight per gallon.

SELECTION OF COMMERCIAL ICE CREAMS

The rapid development of the ice-cream industry has made supplies of this popular dessert available in every community. It may be had at different quality and price levels, in a wide variety of textures and flavors, and in packages of different types and sizes. It may be had in pints and quarts ready packed, or the amount desired by the consumer is packed on order from bulk supplies. Most consumers shop around and find the ice cream they like best without much thought of quality. Some are limited to the product available at the nearest retail outlet.

Standards for Ice Cream. State and local standards establish minimum levels of composition and sanitary quality for ice cream. Standards for composition are stated in terms of the minimum fat content allowed, and in some cases the total solid required. In some states the fat content may be as low as 8 per cent. Some states require at least 14 per cent fat. Other states require a fat content ranging between these two. The total solids content required is about 33 per cent in most states. Because of the ease with which air can be added to ice cream during freezing, some states require a minimum weight for a gallon of ice cream.

Since bacteria develop as readily in ice cream as in milk, sanitary standards are desirable. Some states require that the mixes for ice cream be pasteurized and some specify a bacterial count for ice cream that must not be exceeded, just as is done in the sanitary standards for other milk products. The intelligent consumer should know the standards for ice cream required in her community.

As a guide to the states in the establishment of the Sanitary Standards, the United States Public Health Service developed a Frozen Desserts Ordinance[1] and Code, to guide states and local agencies in the development of satisfactory protective measures.

There are as yet no Federal standards of quality for frozen desserts. A proposed Standard Definition was published in 1941[2] but hearings were not held because of the effect of the war situation on supplies of milk and milk fat. Briefly these standards proposed for ice cream a minimum fat content of 12 per cent except in case of creams with added flavoring which contained fat. In this case the milk fat might be as low as 10 per cent. The total solids proposed were 1.6 pounds to the gallon. Each gallon of finished cream must weigh 4.5 pounds. It was suggested that not more than one half of one per cent of gelatin or gums be allowed.

Among the additional proposals submitted for discussion were these:

Custard-type ice creams should contain 1.5 to 2 per cent egg.

Fruit ice creams should contain 10 per cent fruit and no artificial flavor unless the package indicated artificial flavor added.

Sherbets must contain a minimum of 2 per cent by weight of milk fat and not less than 8 per cent of total milk solids. They should have a fruit content of 10 to 20 per cent, and a maximum gum or gelatin content of not more than one half of one per cent of finished weight. Sherbets should weigh six pounds to the gallon.

Water ices should contain 10 to 20 per cent fruit and conform to the same requirement for vegetable gum or gelatin as sherbets.

Specifications for Ice Cream. The foregoing standards protect products so labeled by the establishment of minimum specifications. Many manufacturers produce ice creams above this minimum quality. Large-scale consumers frequently buy on the basis of specifications that prescribe the amount of milk fat, milk solids not fat, and the weight per gallon of the resulting product. The price paid is established on the basis of these specifications. Consumers might well avail themselves of similar protection when purchasing the better grades of ice cream by requesting the same information about the product.

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[1] United States Public Health Service unnumbered processed document issued May, 1940, Washington, D.C.

[2] Food and Drug Administration notice of hearing on Federal Standards for Ice Cream, *Federal Register* (November 1, 1941), Vol. V, p. 5574.

HOME PREPARATION

Making frozen desserts at home is far less common than it used to be. There was a time when every well-equipped home had its freezer, and supplies of milk, cream, and eggs were readily available. The sound of cracking ice and the turning of the freezer was a welcome announcement that ice cream was on its way.

Now home freezers gather dust. Mechanical refrigeration does not supply enough ice for their use. But these new cabinets do provide special compartments for making frozen desserts. These are frozen without stirring and sometimes are called "still-frozen desserts." These desserts require special preparation; so homemade frozen desserts will be discussed under two heads, those "freezer-frozen" with stirring and those "frozen without stirring," packed either in ice and salt or in the trays of the mechanical refrigerator.

Freezer-frozen Ice Creams. The mixtures for these are simply prepared. Rich cream may be just sweetened, flavored, and frozen. Gelatin improves the texture. With less rich cream, egg, starch, and additional milk solids are added for body.

Plain ice cream (sometimes called Philadelphia ice cream) is prepared from cream, sugar, and flavoring. To each quart of cream (18 per cent fat), $\frac{3}{4}$ cup of sugar, $1\frac{1}{2}$ teaspoons vanilla, and $\frac{1}{4}$ teaspoon of salt are used. Gelatin ($1\frac{1}{2}$ teaspoons to each quart of cream) improves the texture.

When the cream mixture has less than 18 per cent fat, some filler is desirable. The filler most used is egg. This makes a custard base.

Frozen custard. Soft custard (see page 110), needs to be sweeter if frozen than if served unfrozen. Gelatin may be added to the custard while hot; if only the yolks are used in making the custard, the well-beaten whites may be added to the custard when it is partially frozen.

French ice cream is made from a mixture of cream and custard in varying amounts.

Other fillers commonly used in the home are listed below. Gelatin may be added to these in the same general proportions as suggested for plain ice cream.

Starch or flour cooked with the cream gives body. The flour or starch should be combined with a small amount of the cream and heated to boiling to thicken. Add to the remainder after cooling. Use three tablespoons of flour or one and a half of starch to each quart of cream.

Concentrated milk solids in form of dried whole, evaporated, or condensed milk give body. Directions are given by the distributors of these products for their use in frozen mixtures.

Ice-cream mixes similar to the commercial mixes are available for home use. Some of these contain dried cream and require only the addition of water; others require the addition of top milk or cream. It is well to calculate the cost of the ingredients in making desserts from these mixes. In some cases it is about the same as that of a comparable amount of ready-frozen commercial ice cream.

Still-frozen Mixtures. These mixtures must have air added in the form of whipped cream or beaten egg whites, or must be made from a well-filled basic mixture into which air can be beaten directly.

A **mousse** is prepared from cream, whipped (see page 125), flavored, and frozen. For a pint of cream, use 9 tablespoons sugar and 1 teaspoon vanilla. Whip the cream; it should double in volume. Add the sugar and flavoring. Pour into mold and pack in ice and salt, or place in tray of a refrigerator to freeze.

Fruit mousses are prepared by using 1 cup fruit juice and pulp combined with 1 or 2 cups heavy cream, whipped. The fruit mixture should be smooth. The addition of a little gelatin (1 teaspoon softened and dissolved in 2 tablespoons water) to each cup of fruit makes for a smooth product. Sweeten to taste and add $\frac{1}{8}$ teaspoon salt and 1 to 2 tablespoons lemon juice. For best results partially freeze the fruit mixture and beat to incorporate air. Then fold in the sweetened whipped cream. Return to the tray to freeze.

Parfaits are mousses with added egg white. One to two egg whites are used to each cup of cream. For a plain parfait, 1 cup heavy cream, 2 egg whites, $\frac{3}{4}$ cup sugar, and $\frac{1}{3}$ cup water are used. Make a sirup from the water and sugar. Boil to "thread" (230° F.). Pour hot over the well-beaten whites, continue beating until the mixture is cool, then fold in the whipped cream. Combine, pack in ice or salt, or place in refrigerator tray for freezing.

Mousse-type ice creams have been developed for freezing in mechanical refrigerators. In these, the heavy cream is whipped and added to an equal amount of evaporated milk, thin cream, or rich milk thickened with gelatin, egg, flour, or marshmallows. These mixtures should be well chilled and beaten to incorporate as much air as possible before the whipped cream is folded into them. When evaporated milk is used, it should be chilled and beaten until light and frothy before it is combined with the whipped cream.

Well-beaten egg white may be added to these mixtures in addition to the whipped cream. This cuts the excessive richness of the heavy cream and at the same time improves the texture.

The following flavors are suggested for mixtures made from 1 cup cream whipped and 1 cup thin cream or rich milk, 6 to 8 tablespoons sugar, and a dash of salt. One-half cup strong coffee may be substituted for $\frac{1}{2}$ cup of the thin cream. One-quarter pound peppermint stick candy may be substituted for the sugar.

The sugar may be melted carefully and $\frac{1}{2}$ cup chopped almonds stirred into it and heated until nuts are lightly browned. Then the mixture is crushed and added to the cream. Vanilla and a few drops of almond extract may be used for flavoring.

One or two squares of unsweetened chocolate may be added to the milk or thin cream in place of the other thickening agents suggested. More sugar will be required than for other flavors. The mixture is cooked until smooth. This requires a lower temperature to freeze than the other mixtures, especially when the larger proportions of sugar and chocolate are used, but this makes a rich and palatable dessert. Grated or shaved sweet chocolate used to flavor these desserts will not affect the freezing time.

Water Ices. To each quart of water use $\frac{3}{4}$ cup of lemon juice, a little grated rind of the lemon, and 2 cups of sugar. One and a half tablespoons of gelatin may be added. Boil 2 cups of the water with the sugar just long enough to dissolve. If gelatin is used, add after soaking to the hot sirup. Add the remainder of the water and cool the mixture before adding the fruit juice. These are most successful if frozen in a freezer.

For ices of other flavors use 1 to 2 cups of juice or pulp to replace an equal measure of water and omit the lemon juice or decrease it to $\frac{1}{4}$ cup. The inclusion of fruit pulp increases the smoothness of these mixtures.

Sherbets. Add 2 egg whites stiffly beaten to the proportions above.

Milk sherbets are prepared by using milk to replace all or part of the water.

Velva Fruit. Velva fruit is a frozen dessert prepared from fruit pulp. While originally developed by the Bureau of Agricultural and Industrial Chemistry, U.S.D.A., as a commercial product, methods for home preparation of this dessert have been worked out by the Bureau of Human Nutrition and Home Economics. Purées prepared from any well-flavored fruit can be used. Berries, cantaloupe, grapes, peaches, and apricots are specially desirable. To make this dessert, use 3 cups fruit purée, $\frac{3}{4}$ to 1 cup sugar, 2 tablespoons lemon juice, $\frac{1}{8}$ teaspoon salt, 1 tablespoon granulated gelatin, and $\frac{1}{4}$ cup water. Mix the fruit purée, sugar, lemon juice, and salt. Soak the gelatin in cold water until softened; then dissolve over hot water. Add the gelatin to the fruit mixture when both are at room temperature (70° F.). Freeze until firm in the mechanical refrigerator, set at its lowest point. Remove quickly to a bowl and beat rapidly to incorporate air. Then return to the refrigerator, still set at lowest temperature, to harden. Incorporation of air gives the characteristic smoothness to Velva fruit; therefore it is better adapted to commercial preparation or preparation in a home freezer turned by hand. After the initial freezing, it can be kept in the tray of a mechanical refrigerator.

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XII · Salads and Salad Dressings

Originally the term *salad* designated a dish prepared from raw greens simply dressed with oil and seasonings. This still might be called a true salad. But as the term is used today, a salad might be described as any food or mixture of foods garnished with a green salad vegetable and served with a tart dressing. The requirements for a salad are these: something crisp, at least a garnish of green vegetable, a well-seasoned tart dressing, and everything chilled. A few salads are served hot but these are exceptions to the general rule. Hot potato salad is an example. Simplicity and appetizing color are desirable in salads.

There are two parts to every salad, the body or basal portion and the dressing which gives flavor and richness to the mixture. Under the present interpretation of a salad, the basal part may consist of uncooked, cooked, or canned vegetables, or fruits, nuts, cheese, cooked meats, fish, poultry, or eggs. Even rice and macaroni may be used in salads when properly combined with typical salad greens. An indefinite number of combinations is possible and the proportions may be varied according to taste and materials available.

A Simple Salad · A mixture of greens simply dressed with oil and seasonings

U.S.D.A.

KINDS OF SALADS

From the standpoint of use in the meal, salads are divided into two groups, light and heavy, according to the amounts of energy and protein which they furnish to the meal.

Light Salads. Light salads are simple combinations of flavor fruits or fresh green vegetables, simply dressed, usually with French dressing. These salads are valued for their appetizing qualities. Their function is to stimulate rather than to satisfy the appetite. They are served either with the meat course, between the main course and the dessert, or as the first course of a heavy meal, such as dinner.

Heavy Salads. Heavy salads have as their base the food fruits, cooked vegetables or meat, cheese, eggs, and nuts. Some crisp vegetable material should be added. The dressing may be heavier than that used on light salads, such as mayonnaise, a cream dressing, or a cooked salad dressing. The dressing and body of such a salad should be so combined that the flavor of the dressing permeates all parts of the basal material. In such a salad one may find the main elements of a meal combined in one dish. A heavy salad is frequently the main dish in a light meal, such as luncheon or supper.

H. J. Heinz Co.

A Light Fruit Salad · Light salads stimulate rather than satisfy the appetite

Materials for Salads. The kind of salad may be varied at will by appropriate choice from garden or market supplies. Some of the more distinctive salad materials are given below.

Salad greens are available in quantity and in most markets in wide variety. The increased production of lettuce is the best index of the increase in the use of salads in this country. This is due in part to the emphasis on the importance of uncooked green foods in nutrition, and in part to improved transportation and refrigeration, which have made lettuce and other fresh vegetables available at all seasons. These leafy materials should be a part of all salads, not just a garnish; and frequently they are served alone with a simple dressing. In bleached lettuce, crispness is gained at a sacrifice of the vitamin-A content.

The use of other green salad vegetables might well be increased. Romaine, escarole, endive, watercress, chicory, and fennel are available in many markets. Chicory can be stored for winter use. Watercress is available to many rural homes for the gathering and is being distributed commercially in rapidly increasing amounts. It has a characteristic piquant flavor and is high in vitamins A and C. It is used alone, with a mixture of other greens, or as an addition to other salads. Fresh tender spinach may be used uncooked in salads.

Cabbage stands out as a salad vegetable. It is available the year round. Freshly shredded, or chopped, raw cabbage is one of the least expensive sources of vitamin C. It may be the basis of a salad, as in the various forms of slaw, or combined with other materials in mixed salads.

Celery also is available the year round in most markets. Less rich in nutrients, it excels in crispness and gives flavor and texture to many salads, especially those using cooked materials, such as meat, fish, poultry, and potatoes.

Tomatoes contribute maximum amounts of their vitamin-C content when served as a salad. They may be served alone sliced, simply dressed with salt and pepper, since their own juice provides the essential tartness. They are also used in many combinations with other vegetables and with dressing added.

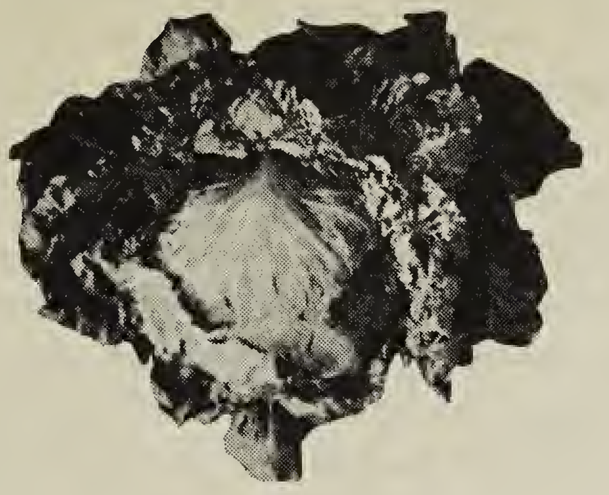
Cucumbers, garden-fresh, have a flavor all their own. Their crisp texture should be preserved by cool storage, or short soaking in ice water. Salt water toughens them. Sliced, they are used alone, or in combination with greens and a simple dressing. Sour-cream dressing is particularly good with cucumbers. In cubes, they add crispness and flavor to salads made from cooked vegetables and meats. Cucumbers may be peeled or not, as desired.

Onions should be used with discrimination but their flavor improves most salads. The strong varieties should be used in moderation, grated, for seasoning only. The sweet varieties, ice-cold and sliced thin, add crispness along with their sweet, mild flavor.

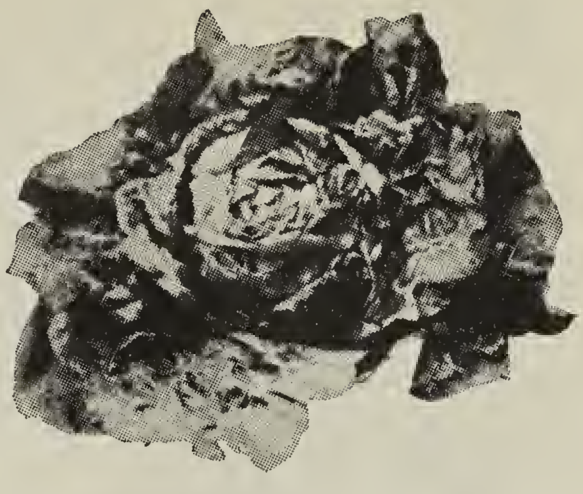
Fruits add desirable flavor and texture as well as minerals and vitamins. Those most used for salads are grapefruit, oranges, apples, pears, pineapple, avocados, and bananas. Any other fresh fruit may be used. Pineapple, grapefruit sections, pears, and mixed fruits are canned for use in salads. Prunes and figs are used dried.

A Heavy Salad · Such salads are used as the main dish in a light meal

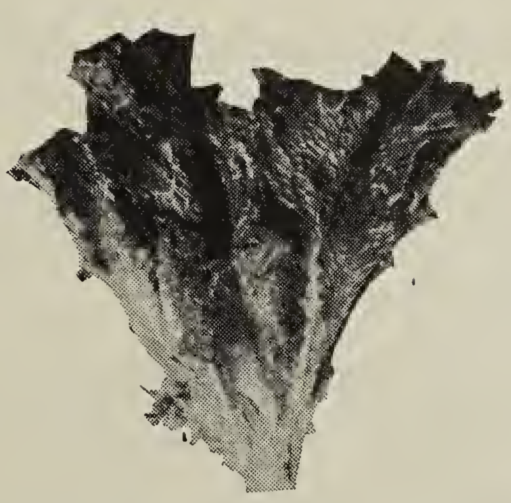
H. J. Heinz Co.



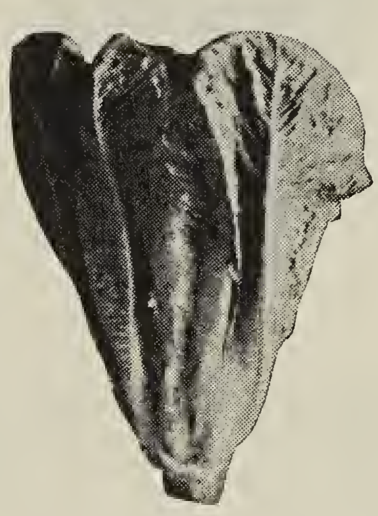
The *Crisphead types* usually designated "iceberg" have firm heads and crisp texture. The inner leaves are bleached white



The *Butterhead types* (Big Boston) have soft heads and green buttery leaves



Leaf or bunching types form no heads



Romaine type lettuce has stiff narrow leaves that form elongated heads

U.S.D.A.

Types of Lettuce

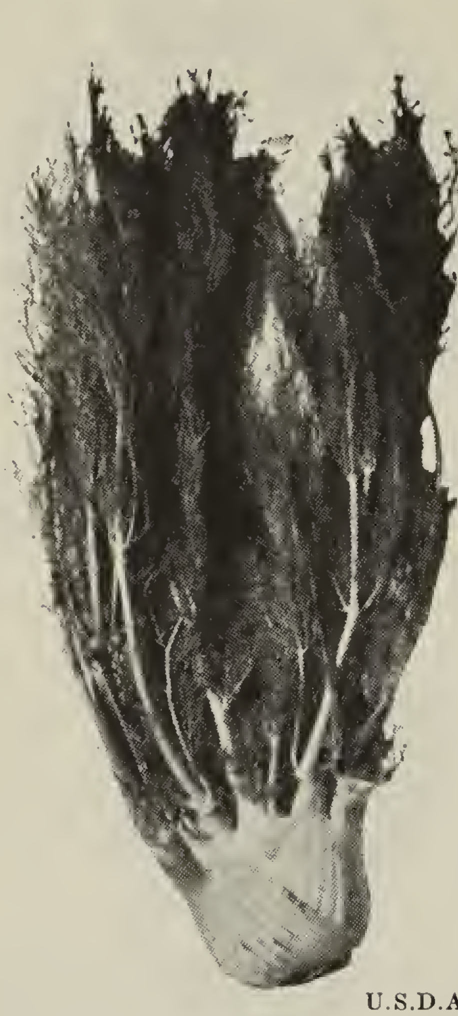
Cooked meat, poultry, and fish, as well as hard-cooked eggs, cheese, nuts, and cooked potatoes may form the base of many heavy or main dish salads.

NUTRITIVE VALUE

While properly made salads contribute much in appetite appeal to a meal, they should not be looked upon as mere accessories. They are good appetizers and aids to digestion. Light salads are valuable sources of minerals and vitamins. Heavy salads may contribute considerable protein and energy, as well as other nutrients, and may furnish most of the essentials needed for a light meal, such as lunch or supper.

SALAD DRESSINGS

The essential ingredients of any salad dressing are acid, fat, and seasonings. The acid is usually lemon juice or vinegar, although it may be any acid fruit juice. The fat may be a vegetable oil—corn, cottonseed, peanut, or olive, or a combination of these—or any well-flavored animal fat, such as bacon drippings, rendered chicken fat, drippings from fresh pork, cured ham, or beef, or butter or margarine. The fat is selected for flavor, but only oils can be used for certain types of dressings. Seasonings may vary with taste. Among those most frequently used are salt, pepper, paprika, red pepper, onion, mustard, sugar, tabasco sauce, ketchup, Worcestershire sauce, and herbs.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Fennel adds special flavor as well as crispness · It is used as one would use celery

Kinds of Salad Dressings. In making a salad dressing, the most difficult problem is to combine the high proportion of fat with the liquid acid without having them separate.

In the uncooked dressings the fat is mixed with the acid by shaking or beating. When the fat is an oil an emulsion can be formed, but it is a temporary emulsion. When protein, such as egg yolk, is added to the liquid portion before the oil is emulsified, under certain conditions each globule of oil may become coated with the protein, thus forming a permanent emulsion in the liquid, similar to that of the fat in milk. Fat in this form does not separate upon standing.

Shredding Cabbage for a Salad

In cooked dressings the fat is prevented from separating by thickening the liquid with egg, starch, or both. In this case the fat is held in suspension in the thickened liquid.

Classification of Salad Dressings. The following is a simple classification of salad dressings based upon the way the fat is held in the dressing:

I. *Uncooked Salad Dressings.* 1. Simple mixtures of bacon fat, acid (usually vinegar), and seasonings

2. French dressings or temporary emulsions: oil and acid (vinegar or lemon juice) with any desired seasonings

3. Permanent emulsions:

Cream dressings: (*a*) Thick sour cream and seasonings. (*b*) Thick sweet cream, acid, and seasonings

Mayonnaise[1]*:* Egg, oil, acid, and seasonings.

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[1] The definition of *mayonnaise* according to the Food and Drug Administration is: "Mayonnaise, Mayonnaise Dressing, Mayonnaise Salad Dressing, is a semisolid emulsion of edible vegetable oil, egg yolk or whole egg, and vinegar or lemon juice, with one or more of the following: salt, and other seasonings commonly used in its preparation, sugar and/or dextrose. The finished product contains not less than 50 per cent of edible vegetable oil.

Mayonnaise has been known for centuries, and there are many legends concerning its origin. One of these states that it was first made in Bayonne, France, and therefore originally was spelled "Bayonnaise." Bayonne is now celebrated for its salad oil, a fact which lends interest to this story. Another tale of its origin says that this dressing was first made with cream instead of with oil. One day the Duc de Mayenne was having a dinner party, when the chef discovered the cream was sour. In his desire to please his master, he prepared the dressing with an oil. The result was a sauce of new and delicate flavor, and it was then named after the host at whose table it was first served.

Mock mayonnaise: An emulsifying agent other than egg is used, such as evaporated milk, gelatin, or starch paste. (Such dressings must be labeled "salad dressing" on the market.)

II. *Cooked Salad Dressings.* These dressings consist of a liquid (milk or water and vinegar) thickened with egg or starch or both, to hold the fat in suspension. The usual seasonings are used. (When these dressings are made commercially they must be labeled "Salad dressing.")

1. True custard basis (all the thickening is done with egg, either yolk or whole egg).
2. Cheap custard basis (both starch and egg are used). This is the most usual way of making a cooked dressing.

Fluting a Cucumber

Methods and Proportions. The amount and form of fat, the relative amount of acid used, and the methods of combining vary with the kind of dressing. French dressings, mayonnaise, and cooked salad dressings are discussed here.

French Dressings. French dressings are mixtures of fat, acid, and seasonings, which are combined by beating or shaking just before using. The beating or shaking breaks up the fat into small globules which are scattered through the liquid, forming an emulsion. When this dressing stands before use, the globules of fat run together or coalesce and the fat and liquid separate. Oil in water alone forms only a temporary emulsion. The emulsion in French dressing is slightly more stable than oil in ordinary water, since acid reduces the viscosity of the oil and makes it easier to form small globules. Also, the dry seasonings, especially paprika and mustard, are finely divided insoluble powders which tend to remain in suspension in liquids. They hold the fat globules apart and retard the separation of the fat. Aside from salt, paprika is used more than any other seasoning.

The proportion of acid to oil varies with taste and with the acidity of the vinegar or lemon juice. From $\frac{1}{4}$ to $\frac{1}{2}$ as much acid as oil may be used for French dressing, with salt, paprika, onion juice, garlic, chives, herbs, tabasco, sugar, and other seasonings as desired. To 1 cup oil and $\frac{1}{3}$ cup acid, at least 1 teaspoon each of salt and paprika are needed. Other seasonings are optional. An easy way of obtaining onion flavor is to allow the vinegar to stand on sliced onions for a while before making the dressing. Mix a French dressing just before using, or, if it is made in advance, remix just before serving. A bottle is convenient for mixing, storing, and serving.

Mayonnaise. This dressing contains the fat in a permanent emulsion. Egg yolk is the protein. The liquid and oil must be combined in such a way that the oil will be broken up into small droplets, each coated with liquid-protein solution. Emulsification is facilitated if the egg mixture is thick and contains some added water (vinegar or lemon juice). This dilutes the protein solution and enables it to spread over more surface (of fat globules). If the seasonings (salt, pepper, paprika, and mustard) are added to the egg yolk, it thickens and acid can be added to bring it to the right consistency. This requires about one-third of the acid. At first the oil is added drop by drop, and beaten in with a rotary beater. After the oil begins to emulsify, it may be added more rapidly. When about half the oil has been added, the mixture will be quite thick and then should be thinned by adding another third of the acid. The remaining oil then can be added, and the remaining acid beaten in at the last. The oil combines best at room temperature, since it is thinner than when chilled. Stopping the beating from time to time to add the oil and acid seems to facilitate the coating of the globules with the protein solution.

When, for some reason, fat fails to form an emulsion or the emulsion breaks and the fat separates, the easiest way of reforming it is to begin with a new egg yolk, adding the curdled or broken mayonnaise gradually to the yolk. In other words, the curdled mayonnaise is treated as though it were all oil.

The broken emulsion can be reformed also by adding it very gradually to a tablespoon of vinegar with hard beating. (The vinegar is not added to the curdled mayonnaise, but the curdled mayonnaise to the vinegar.)

Basic proportions for mayonnaise are these: one egg yolk to 1 cup oil, 2 tablespoons vinegar or lemon juice, 1 teaspoon salt, $\frac{1}{4}$ to 1 teaspoon paprika, dash cayenne, and $\frac{1}{2}$ teaspoon mustard. Mustard facilitates the formation of a stable emulsion, but may be omitted if the flavor is not desired. More acid may be needed and other seasonings added, as desired. Onion flavor may be added by grating in to taste or by the use of onion-flavored vinegar.

Mayonnaise should be stored in a covered container, since evaporation will dry out the surface and tend to break the emulsion. It should be kept under refrigeration, but never allowed to freeze. Freezing also will break the emulsion.

Cooked Salad Dressings. These dressings are made on the basis of a custard. Milk or water and vinegar make up the liquid. The custard may be thickened with egg alone or with a combination of egg and starch. (The starch is usually flour, although cornstarch may be used.) Vinegar is added for tartness after the mixture is thickened, so that it will not curdle the milk if milk is used, and so as to avoid hydrolyzing the starch if starch is used. Fat is added, usually as butter, margarine, or heavy cream.

Basic proportions are these: one cup liquid ($\frac{3}{4}$ cup milk and $\frac{1}{4}$ cup lemon juice or vinegar), 1 tablespoon flour, 1 tablespoon sugar, 1 teaspoon salt, $\frac{1}{2}$ to 1 teaspoon each of mustard and paprika, 1 egg or 2 egg yolks, and 2 tablespoons butter or margarine or $\frac{1}{3}$ cup cream. Mix the flour with the dry seasonings, add all but a few tablespoons of the milk, and bring to a hard boil, stirring constantly. Put into a double boiler and add the egg diluted with the remaining milk. Cook over hot water, stirring constantly until the mixture thickens. Remove from the heat, stir in the fat, and blend thoroughly. Cool, and add vinegar. One or two more yolks may be used and the flour omitted. In this case, the dressing should be cooked as a true custard, and the vinegar or lemon juice added last.

When cream is used it may be whipped and added last. In this case the butter or margarine may be omitted.

Variations in Dressings. From the basic recipes of salad dressings, many variations of each kind can be made. Rendered chicken fat, mild-flavored bacon, or ham drippings may be used to vary the flavor and character of French dressings; however, fats combine less completely than oils. Also, variety may be obtained by varying the kind of vegetable oil. Many people like the flavor of olive oil best, but it is more expensive than the other oils. A mixture of olive oil and one of the less expensive vegetable oils will reduce the cost, yet give the flavor of olive oil.

Tarragon vinegar will give a special flavor to French dressing when used in place of lemon juice or plain vinegar.

Cheese dressings are made by adding grated hard cheese to French dressing or by rubbing soft cheese to a paste with the dressing.

Herb dressings are made by adding minced parsley, marjoram, and a small amount of thyme to French dressing.

Chiffonade dressing is made by the addition of chopped onions, peppers, pimientos, parsley, hard-cooked egg, etc. to plain French dressing.

Vinaigrette dressing is made by adding chopped chives and chopped hard-cooked egg to a French dressing containing horseradish and ketchup or chili sauce, or both.

Lorenzo dressing is a special French dressing flavored with currant jelly and chili sauce. Honey sometimes is used in place of sugar. It is an excellent dressing for fruits.

Thousand Island dressing is a variation of mayonnaise, made by adding different combinations of a great variety of ingredients such as chives, capers, chopped green peppers, pimiento, pickles, olives, onions, and hard-cooked eggs.

Russian dressing is made with about $\frac{1}{2}$ as much thick chili sauce as mayonnaise.

Tartar sauce is a variation of mayonnaise, often used as a sauce for fish rather than as a salad dressing. It has chopped cucumber pickles and frequently chopped parsley and chopped onion added to mayonnaise. The characteristic flavor of tartar sauce is due to tarragon, either the chopped or the powdered herb, or tarragon vinegar. (See page 353.)

Vegetables in a Hydrator • Clean, crisp vegetables make salad preparation easy

Cooked dressings also may be varied. Other fats than butter or margarine can be used. Fruit juices of all kinds may be substituted for the vinegar or lemon juice. Honey may be used instead of sugar. Whipped cream may be folded into a cooked dressing. Such dressings are excellent with fruit salads.

PREPARATION OF SALADS

Salad making is a simple task if the materials are at hand, ready for use, and at the correct temperature. Most salads are best mixed just before serving. This requires foresight and proper care and storage of the salad materials, so that they will be ready when needed.

Care and Storage. Proper care and storage of all the materials is the first step in preparation. The care needed will vary with the fresh salad greens, cooked vegetables, fruit, meats, poultry or fish, and the dressings.

Salad greens should be cared for as soon as they reach the kitchen. They should be looked over carefully and any imperfect leaves removed. They should be washed thoroughly and placed in a porcelain or enameled salad pan with a lid. Most of the modern refrigerators have a compartment for this purpose. There should be no water in the pan except that left clinging to the leaves after washing, shaking, and draining well. The crisp vegetables will remain crisp for several days or a week if kept covered in a good refrigerator. Cared for in this way they always will be ready for immediate use.

Other uncooked vegetables, such as tomatoes, cucumbers, green peppers, carrots, radishes, celery, and many other salad vegetables, should be washed well and placed with the lettuce and other greens where they will be in perfect readiness for quick preparation of a salad.

Canned fruits should be drained thoroughly. **Fresh fruits** which oxidize (darken) upon exposure to the air may be covered with French dressing, lemon juice, or certain other fruit juices to retain their bright color.

Cooked vegetables for use in salads should be cut into appropriate sizes and placed in a covered container in the refrigerator. Starchy foods lacking flavor, such as potatoes or macaroni, are improved by marinating (standing several hours after dressing with a small amount of well-seasoned French dressing) before they are combined in salads.

Meat, poultry, and **fish** are highly perishable and should be kept in the coldest part of the refrigerator, even after they have been cooked. While these foods do not lack flavor, they are very compact in texture and need marinating for several hours in order that the flavor of the dressing may penetrate the meat. Either a well-seasoned French dressing or any dressing which is to be used later in combining the salad may be used for marinating.

Salad dressings should be prepared far enough in advance to be thoroughly chilled. All kinds of dressings are perishable and should be covered closely and stored in the refrigerator.

Combining Salads. Salads should be combined just before serving to avoid loss of crispness. Even if kept chilled, the dressing wilts the crisp salad vegetables.

A large bowl is the most satisfactory utensil for mixing a salad. A large wooden fork and spoon make it possible to handle the fragile materials of a salad with minimum damage.

All vegetables should be crisp and cold. Fresh vegetables must be dry, and canned vegetables and fruits should be well drained to prevent diluting the dressing. The materials should be cut with a sharp knife into pieces of the desired size, and not broken, bruised, ground, or mashed. The pieces always should be of sufficient size to retain their identity.

In dressing the salad, add just enough dressing so that all portions get their share. The seasoning of a salad comes from the dressing, but a thin film over the basic materials is all that is needed if the dressing has been properly seasoned.

There are endless possible salad combinations, but usually the simpler the salad, the fresher and more attractive it is. Handle the materials as little as possible and avoid studied arrangements or geometric designs. Strips of pimiento or green pepper, a bit of parsley or minced herbs, or a dash of paprika can give life to an otherwise characterless salad.

Molded salads are discussed under gelatin, on page 220.

Salad Accompaniments. When salad is served as a separate course, or as a main dish, crisp crackers, sandwiches, cheese straws, nut bread, canapés, toast, or rolls are served with it. The lighter accompaniments should be used when the salad is served as a separate course of a heavy dinner.

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XIII · Meat and Its Selection

Meat is the flesh of any animal or any part of an animal used for food. In the broad sense this includes not only mammals but also poultry, fish and shellfish, and game. As the term is ordinarily used, however, it is restricted to the edible portions of mammals which are raised primarily for food.

The kinds of meat are beef (cattle), veal (calves), pork (hogs), and lamb and mutton (sheep). Veal is young beef, just as lamb is young mutton. The characteristics of veal, however, are so different from those of beef that veal is classed as a different kind of meat.

In this country, beef and pork are the meats produced and consumed in largest quantities. The shorter time required to produce pork as compared with beef makes its production very adaptable to market demand. The production and consumption of lamb in the United States are increasing.

The dressed meat animals intended for food are spoken of as dressed carcasses. The carcasses are divided into cuts, which are typical for each kind of meat. First, wholesale cuts are made for convenience in handling and for use by the wholesale trade; and finally, each wholesale cut is divided

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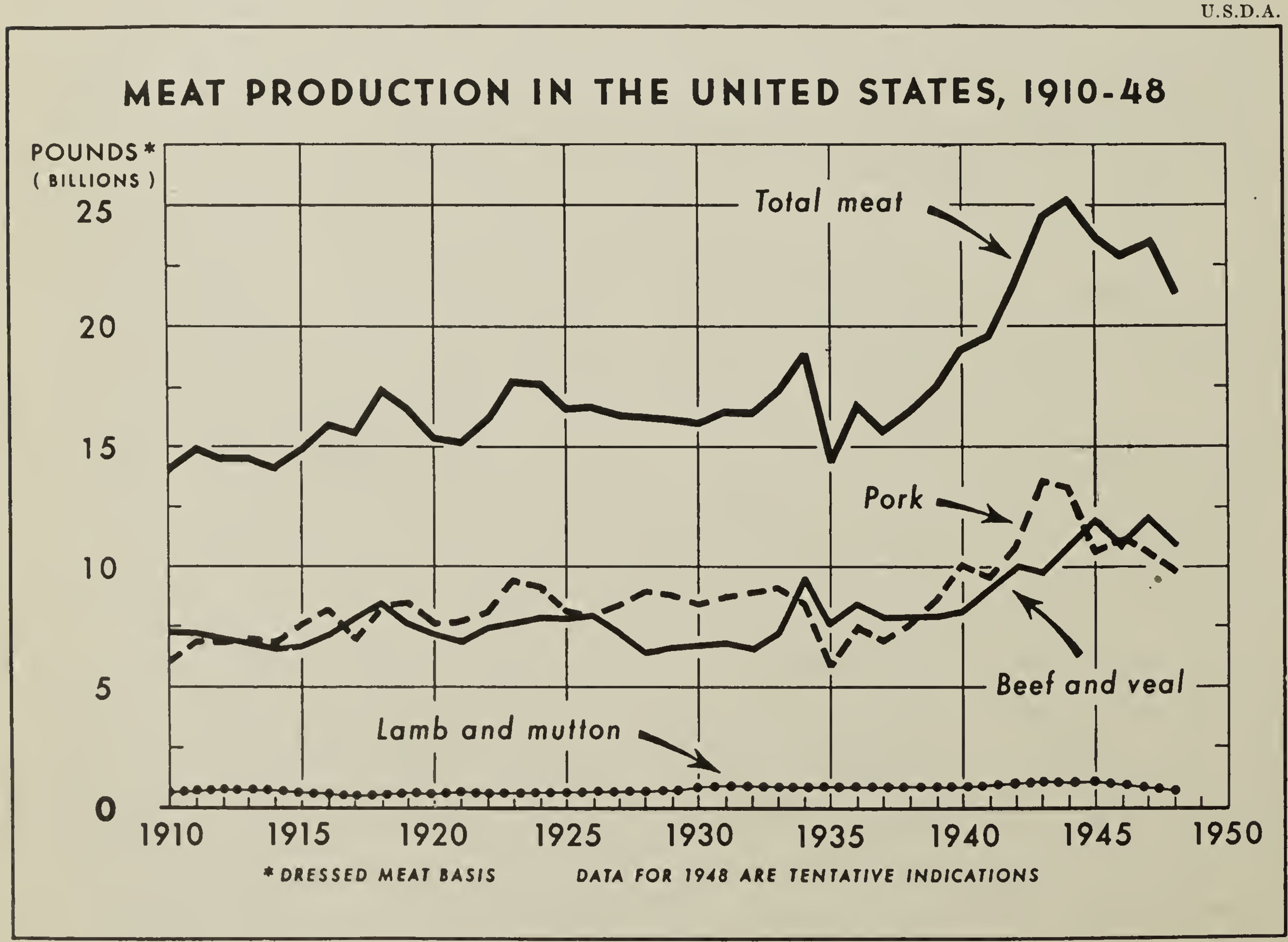


into retail cuts. In dividing the carcass into cuts, the tender meat is separated from the less tender and the thick pieces from the thin. Both wholesale and retail cuts are shown in the beef, veal, pork, and lamb charts which follow on pages 179, 186, 189.

APPEARANCE AND PHYSICAL STRUCTURE

In its gross structure, meat is made up of lean or muscle portion, visible fat, and bone. In addition, certain organs called variety meats are used as food.

Lean or Muscle Portion. The lean portion or muscle tissue is composed of bundles of fibers or muscle cells held together by varying amounts of connective tissue and surrounded by a sheath of heavier connective tissue. The size of the bundles varies in different muscles and determines to a certain extent the grain or texture of the meat.

The individual muscle fibers are elongated, multinucleated, specialized cells. They vary considerably in size depending upon their function and use. Typical fibers are from one to two inches long and less than one five-hundredth of an inch in diameter. Each tubular cell has an outer membranous cover, and the interior is filled with minute rods or tubes, called "fibrillae." The fibrillae are of dense protoplasm and are embedded in a semifluid muscle juice which completely fills the interior of the cell.

Connective tissue is composed of small mono-nuclear cells which form a tough intercellular substance called collagen. The toughness of meat is determined by the amount, density, and form of the connective tissue present in the particular cut. The bundles of muscle fibers are bound by connective tissue into larger bundles, and these in turn go to make up the large and small body muscles. In general the connective tissue binding muscle fibers into bundles and bundles into muscles is smaller in amount and less dense than that which surrounds and separates the body muscles. Each muscle is enclosed in a sheath of connective tissues which may be heavy and tough. These can be seen in a cut like the round separating the individual muscles. The fewer muscles in a cut, the smaller the amount of these dense layers of connective tissue that make meat tough. The fact that the "tenderloin" is composed of one muscle helps to account for its tenderness.

The connective tissue is specially dense at the ends of muscles, where it forms the tendons which attach the muscles to the bones at the joints. Cuts like the shin and the shank, the neck, and certain round and shoulder cuts contain tendons and are always tough. The amount and character of the connective tissue changes with age, so that the meat from older animals tends to be more tough than that from young animals.

There are two kinds of connective tissue, white, which contains collagen, and yellow, which contains elastin. White connective tissue is insoluble in cold water, but if heated at 160° to 190° F. the collagen present is changed into gelatin, which is readily soluble in warm or hot water. Since white connective tissue can be softened by regulation of the method of cooking, it may be said to contribute to "temporary toughness" in meat. Yellow connective tissue is insoluble at ordinary cooking temperatures. It is softened only by treatment in superheated steam or by boiling with strong acids. It may, therefore, be described as contributing to permanent toughness in meat, toughness which is not improved by cooking but only by chopping, or grinding, or by removing the yellow fibers.

The proportion of these two types of connective tissue varies in muscles from different animals and from different parts of the same animal, depending upon the cut.

The total amount of connective tissue varies with the extent to which the muscle has been used, the way the animal has been fed, and its age.

Color of Meat. The pigment hemoglobin and related pigments are responsible for the reddish color in meat. Hemoglobin is found in the blood left clinging to the walls of the capillaries, arteries, and veins. Other pigments are a constant constituent of the muscle plasma. The amount of these varies in different muscles in the same animal, and in the same muscle in different animals. This variation may be due to breed, kind of feed, age, amount of exercise, or to a combination of these and other factors.

Beef muscle is dark in color when it is first cut across its fibers. If the freshly cut surface remains in contact with the oxygen of the air, the hemoglobin is oxidized to oxyhemoglobin, producing a bright-red color. The brightest color is usually attained after about an hour's exposure to the air. Grass-fed beef is darker than corn-fed. The color of the lean also varies with the different kinds of meat animals. Veal is pink to very light red and mutton is darker than lamb. Pork from old hogs is darker than that from young. Lamb is a darker red, however, than beef, and pork and veal are the lightest in color.

Fat. Animals store their excess energy in the form of fat deposited in certain cells of the connective tissue. When a group of these cells are filled with fat, the connective tissue becomes fatty tissue. The deposition of fat in these small cells stretches the walls thin, so fatty tissue tends to be tender.

The amount and distribution of fat vary with the type and breed of animal and with the plane of nutrition. The main fat depots are in the connective tissue around internal organs, around and between muscles, and directly under the skin.

The color and melting point of the fat vary with the kind, breed, and feed of the animal. In general, pork fat and lamb fat are whiter than beef fat, the fat of grass-fed beef often being quite yellowish in color. The fat in veal is white, or pinkish white. Pork fat is the softest, that of beef and veal next, and that of lamb and mutton the hardest. The melting point of the exterior fat is lower than that of the kidney fat from the same animal. The melting point of the fat laid down in an animal under usual conditions conforms to that typical of its kind. Yet in an animal fed large amounts of a fat of a different melting point, the melting point of the fat deposited tends to change. Hogs fed largely on peanuts or soybeans have an oily rather than a solid fat.

Fat in meat adds to its flavor. It also increases the apparent tenderness if not the real tenderness of the cooked meat. It definitely increases the juiciness of the cooked meat. Intramuscular fat, which forms the marbling of the lean, is considered more important in improving flavor, tenderness, and juiciness than cover fat. Some cover fat, however, is very important in cooking. It decreases the time required for cooking, decreases the loss of moisture by evaporation during cooking, and aids in the development of flavor and juiciness. Since some of the fat is lost in cooking or is discarded at the table, there is a point beyond which fattening of meat animals is uneconomical.

Bone. Bone forms the skeletal portion or framework of the meat animal and carcass. The shape of the bones is useful as a means of identifying the various cuts of meat. The character of the bone furnishes information regarding the age of the animal when slaughtered. In fully mature carcasses the bones are flinty white, while in young carcasses they are pinkish in color. Since bone is largely waste, a high proportion of bone increases the cost of the edible meat.

The amount of bone should be observed when selecting meat cuts and comparing prices.

COMPOSITION AND NUTRITIVE VALUE

Meat not only is one of the most universally liked foods, but is an excellent source of certain important nutrients.

Proximate Composition. The composition of the edible portion of different cuts of meat varies within wide limits, according to the kind of meat, the grade, the age of the animal when slaughtered, and the location of the cut in the carcass. In most meat cuts, close to 70 per cent of meat muscle is water. Usually the protein constitutes about 15 to 20 per cent of the edible portion. The fat varies from 5 to 30 per cent. The carbohydrate of meat is negligible, except in the liver, where the glycogen content is from 1 to 6 per cent. The total mineral content of meat is approximately 1 per cent.

The proximate composition of lean beef may be stated as approximately 67 per cent water, 19 per cent protein, 13 per cent fat, and 1 per cent minerals. The widest variations are in the water and the fat content.

PROTEIN. Meat is one of the important sources of high-quality protein. The muscle proteins are complete, that is, they contain all the essential amino acids in approximately correct proportions. Connective-tissue proteins are incomplete; that is, certain amino acids are lacking, or are present in inadequate amounts.

CALORIES. While meat is most valued for its protein and vitamin content, it also furnishes energy. The calorie content varies with the fat, which differs in amount with the kind of meat, the quality or grade, and the cut. Some of the fat may be lost in cooking, so that the amount actually consumed varies within wide limits.

MINERALS. Meat supplies three important minerals: phosphorus, iron, and copper. Meat is one of the rich sources of phosphorus and iron. A serving of liver supplies more iron than a serving of any other food. The value of meat in blood-building is thought to be due in part to its copper content, since copper aids in the utilization of iron.

VITAMINS. Meat is an excellent source of all the B vitamins.

Pork is the richest natural source of thiamine. Variety meats, beef, veal, and lamb also contribute important amounts of this vitamin. All meat is a good source of riboflavin. Variety meats, especially kidney and liver, are rich sources of this vitamin. All meats contain liberal quantities of niacin; meats, poultry, and fish supply 40 per cent of the niacin in the American diet. Meat supplies other B vitamins.

These various B vitamins are readily affected by heat and are also soluble. For this reason, it has been necessary to determine their retention in cooked meats. Research has shown that when meats are cooked so as to have the minimum amount of drippings, and all the drippings are served with the meat, a high proportion of the original vitamin content is retained.

Fat in meat may contain significant amounts of carotene, which forms vitamin A. The variety meats, especially liver and kidney, are rich in Vitamin A.

Digestibility. Meat is easily and completely digested. It is estimated that 97 per cent of the protein and 96 per cent of the fat are absorbed. The extractives, or flavoring substances, in meat act as stimulants to the flow of the digestive juices and, therefore, contribute to the digestion of other foods.

Use in Diet. The nutritive value of meat places it in one of the basic food groups essential to good health. In addition to its food value, however, meat has many characteristics which recommend it for the daily diet. Chief among these are its palatability and satiety value. Because of its pleasing appearance, tempting aroma, and distinctive flavor, properly cooked meat has universal appetite appeal. This is important because palatable foods stimulate the flow of the digestive juices, thus aiding the digestion of other foods. Meals which include meat give a feeling of satisfaction and well-being. Because of the nutritive value of meat and its appetite appeal, it has become customary in this country to plan meals around the meat dish.

SELECTION AND BUYING

In normal times, many cuts of beef, veal, pork, and lamb of varying quality are available to the consumer. In view of the wide range of meat cuts, it is a distinct advantage to the food buyer to be familiar with the kinds and cuts of meat, the methods of cooking most satisfactory for the different kinds and cuts, the factors that determine the quality or grade, and the influence of all these on the price.

How to Learn Cuts. To be able to recognize a meat cut, the consumer must know the characteristics of the different kinds of meat, and the location of the cut in the carcass.

Kind of Meat. High-quality beef has a smooth covering of firm, creamy white fat evenly distributed over the exterior. The lean of top-quality beef is uniform and bright, although the color may range from pale red to deep blood red. It is well marbled with creamy white fat. The texture of the lean is yielding and velvety to the touch, and fine in grain. The bones in young or baby beef are reddish and porous, while in older animals they are white and flinty.

High-quality veal, however, has very little fat, but what there is should be clear, firm, and white, or with a slightly pinkish tinge. The lean is light pink with no marbling. The texture of the lean is very fine, only fairly firm, and velvety in appearance. Since veal is from young animals, the bones are always porous and soft, with a reddish tinge. The ends of some of the bones are still in the cartilaginous stage.

There is more fat on pork than on the other meats. The fat is only fairly firm and very white. The color of the lean of young pork is light pink, turning to a delicate rose color in older animals. The lean is well marbled with fat. The texture of the lean is firm and fine-grained. The bones are porous and pinkish in color.

High-quality lamb has a smooth covering of clear, white, brittle fat over most of the exterior. The lean is pinkish red in color. In yearling lamb it is a deeper red. The texture of the lean is fine-grained and velvety in appearance. The bones are porous and reddish in color.

High-quality mutton has the same characteristics as lamb, except that there is more fat, the lean is darker in color, and the bones are hard and white.

Retail Cuts. In order to identify the cut one must know the location in the carcass or side of meat, and the shape of the bone and muscle structure in each cut. Diagrammatic drawings on later pages in this chapter show the location of the cuts in all four kinds of meat. These are followed by pictures of typical cuts of beef, veal, lamb, and pork.

JUDGING THE QUALITY OF MEAT

The consumer is interested in the shape and thickness of the cut and the amount of lean in relation to the fat and bone. These will vary in the same cuts from animals of different shape, or conformation.

The term *conformation* covers the general build, form, shape, and contour or outline of the carcass, side, or cut. Good conformation implies short necks and shanks, deep plump rounds, thick backs and full loins, well-fleshed ribs and thick flanks. In other words, the most desirable cuts from loin, ribs, and round have full muscles and a large proportion of edible meat to bone.

Fat contributes to quality in meat. The term *finish* refers specifically to the character, amount, and distribution of fat. The best finish implies abundant marbling (intermingling of fat with lean) and a smooth, even covering of firm fat over the exterior surface of the carcass, side, or cut. A good finish adds to the appearance of the cut. Its greatest importance, however, is that a certain amount of fat is essential to juiciness and flavor in the cooked product.

Quality is judged also by the appearance and feel of the muscle tissue. Firm, fine-grained muscle tissue tends to be tender. The color should be even and typical of the meat type. A large amount of connective tissue lowers the quality.

U.S.D.A.

Stamping Grade on Meat · The Federal meat-grader uses an inked roller to mark the grade on the full length of the cut. The markings are so spaced that one appears on every retail cut

Quality Grades. Inasmuch as the price of meat varies with quality, United States grades have been established based on the foregoing characteristics. The U. S. Department of Agriculture, in 1915, began work on the development of grade standards. With the co-operation of the Better Beef Association, the National Live Stock and Meat Board, and the meat packers, the official grading and stamping of beef was instituted at Chicago and nine other key cities in 1927. Later this service was extended to include lamb, mutton, and veal.

Table XXXIII · ***Grades of Beef, Veal, Lamb, and Mutton***

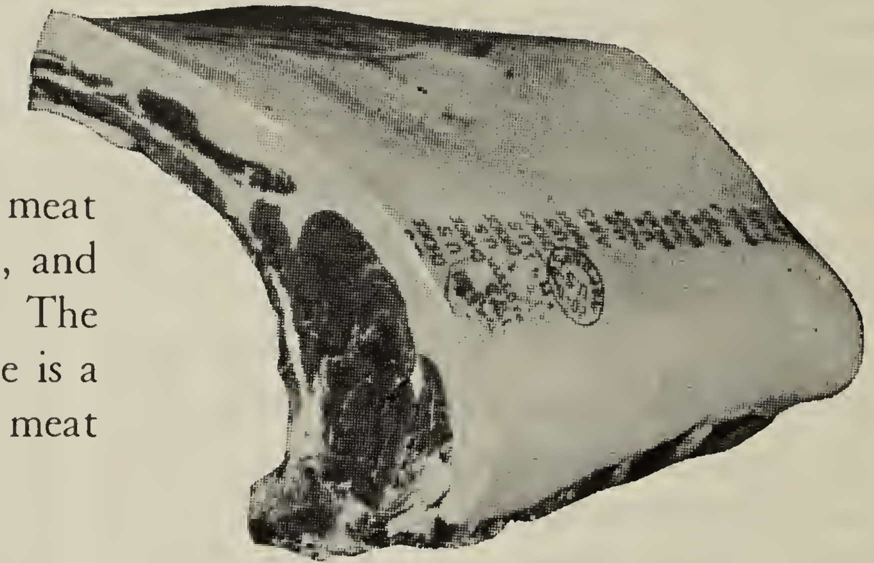
Variety and Grade	Grade Mark when Graded by an Official Grader of the U. S. Department of Agriculture
Beef, veal, lamb	
Prime	U. S. Prime
Choice	U. S. Choice
Good	U. S. Good
Commercial	U. S. Commercial
Utility	U. S. Utility; U. S. Cull (Lamb)
Cutter and canner . . .	U. S. Cutter (Beef); U. S. Canner (Beef); U. S. Cull (Veal)
Mutton	
Good	U. S. Choice
Commercial	U. S. Commercial
Utility	U. S. Utility; U. S. Cull

Early in 1943, when price control was established as a wartime measure, the grade marking of all beef, veal, lamb, and mutton was made mandatory. This regulation was rescinded in the fall of 1946 when ceiling prices were removed from meats. Grade marking of meat now is optional except in a few cities. Where available it is a protection to the consumer.

Table XXXIII shows the different grades and marks for beef, veal, lamb, and mutton.

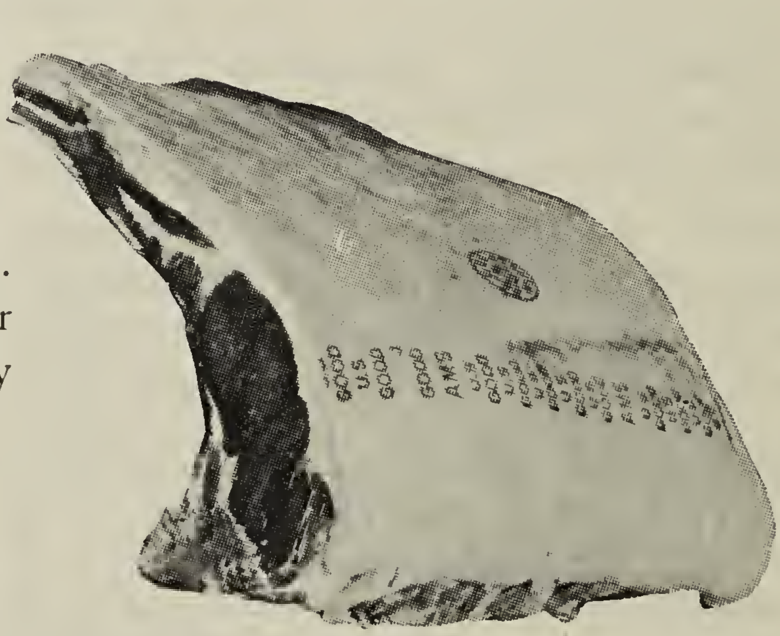
U.S. Prime is the highest quality of meat and, therefore, brings the top prices. Carcasses carrying this grade label are from the show animals of the meat industry. There is a comparatively small amount of prime grade meat, and in certain seasons and in some localities none at all. The lean is exceedingly well marbled with fat, and there is a heavy cover of fat over the entire carcass. In beef, only steers and heifers qualify for this grade. Prime meats are used mostly by the best hotels, restaurants, dining-cars, and steamships.

Choice rib cut



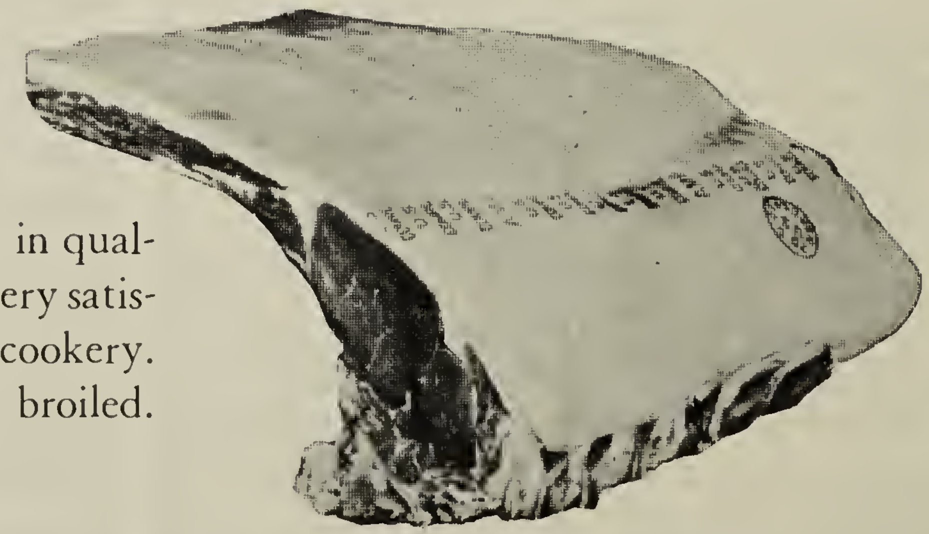
U.S. Choice is the highest quality of meat ordinarily available to the retail trade, and generally brings the highest retail price. The lean is well marbled with fat and there is a good fat covering. Many cuts of such meat are excellent for roasting and broiling.

Good rib cut



U.S. Good is the next highest in quality. Although the fat content is slightly lower than that of Choice, this grade is satisfactory for much the same purposes as Choice.

Commercial rib cut



U.S. Commercial is next to Good in quality. It is very economical meat and very satisfactory for all moist-heat methods of cookery. The tender cuts may be roasted and broiled.

U.S.D.A.

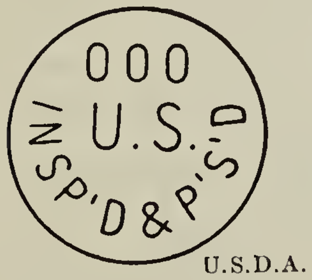
These Are the Grades Most Frequently Seen on the Consumer Market

U.S. Utility is next to Commercial in quality. Most cuts in this grade require long, slow cooking with added water.

Many packers have their own brands designating quality, which correspond to the government grades. The packer's name or his brand may be used in addition to government grade marks. Packers, however, usually brand only three top grades.

Standard requirements for grading pork cuts sold at retail have not been established by the government. The main reason for this is that pork when slaughtered is more uniform in age than the other meats, which means that it varies less in quality. Pork carcasses and cuts are graded, however, in the wholesale trade on a weight basis. An important difference in the procedure for handling pork, as compared with beef and the other meats, comes from the fact that most pork does not leave the packing plant in carcass form or in quarters. This means that many pork cuts sold at retail are the same as the wholesale cuts.

U.S. Inspection Stamp. Under the Federal Meat Inspection Act of 1906, all meats sold in interstate commerce must be inspected for purity and safety by trained Federal inspectors. The law guarantees that the meat thus sold came from healthy animals, was slaughtered and processed under sanitary conditions, and was suitable in every way for use as food when it left the processing plant.



United States Inspection Stamp · This stamp shows that the meat has been inspected and passed as satisfactory for human consumption

Meats which pass Federal inspection standards are marked with a round purple stamp which states that they are "inspected and passed." The stamp also bears the code number of the plant. The marking fluid used for this stamp is a vegetable coloring and is perfectly harmless. It need not be cut off the meat. In some instances, the inspection stamp, in abbreviated form, is burned onto smoked meats.

About three-fourths of all meat sold in the United States comes under Federal inspection. This service comes under the Meat Inspection Division of the U.S. Department of Agriculture. A large portion of the other fourth is slaughtered under inspection regulations set up by states and cities. The remainder is slaughtered on farms and in small communities where no inspection service is maintained.

Aging of Meat. Aging or ripening—holding in storage at a temperature just above freezing—improves the quality of well-finished beef and lamb. Such meats become more tender and develop during aging a better flavor than they had when first slaughtered. In normal times, much beef and lamb is sold in retail markets within one to two weeks after slaughter. Restaurants and hotels, however, which cater to the highest-class trade usually age their beef for several weeks before cooking. During aging, the small amount of sugar in the muscles is changed to lactic acid by enzymes within the meat. The lactic acid then acts on the collagen, breaking some of it down to gelatin. This makes the meat more tender.

Ultraviolet-ray lamps are used to some extent to speed the aging of meat. Exposing the meat to these rays retards the growth of bacteria and molds so that the meat can be stored safely at a higher temperature than it could be otherwise. Enzyme action, which tenders the meat, thus may be speeded considerably.

To be aged successfully the meat must have a good fat covering to prevent evaporation and deterioration. Choice and Good grades can be aged. Aged meat commands a higher price because of the extra time and handling necessary and the shrinkage involved. Fresh pork does not improve with aging, since the fat of pork has a tendency to become rancid.

PRICE OF MEAT

As with other foods, wise consumers consider the cost of meat. About 56 per cent of the live weight of a meat animal reaches the meat market. The market man has another shrink in cutting the dressed carcass. Usually he is able to sell about 85 per cent of the weight that he buys. The losses help to set the price of meat.

In normal times, the price of the various kinds and cuts is regulated largely by supply and demand. In general, the most popular cuts are the ribs, loins, rounds, or legs. The ribs and loins are the most tender parts of the animal and, therefore, are easily and quickly prepared. The rounds or legs also are preferred to shoulder, brisket, and other cuts by most consumers. This means that the less demanded cuts must be sold at sufficiently low prices to stimulate their sale, while the price is made up on the more demanded cuts —ribs, loins, rounds, or legs.

Price is affected also by the quality or grade of the carcass. Top grades, which are more tender and have a richer flavor, command a higher price than lower grades. This is entirely fair, since it takes more time, feed, and care to produce a high-grade carcass than a low-grade one.

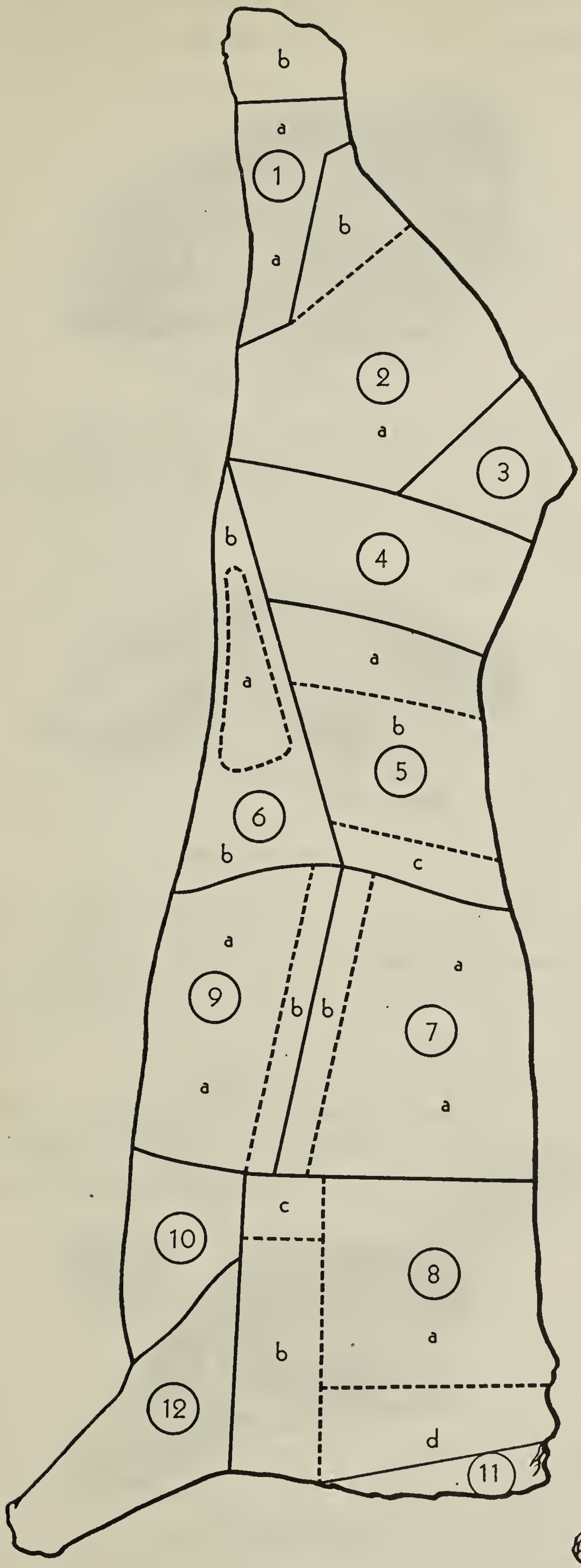
For economy, the wise consumer will learn the less demanded cuts and will make use of them when they are suited to her purpose. These less demanded cuts are usually the less tender cuts, since tenderness is the most important factor in determining the popularity of meat cuts. But when the method of cooking to be used is one that will make less tender meat tender, there is no reason for buying top-grade meat or the choicest cuts. The medium or low grades and the less tender cuts, at less cost, are entirely suitable. The less demanded cuts have practically the same food value as the more popular ones. The price per pound does not tell the cost per pound of edible meat. Waste must be taken into consideration. A cut with considerable bone, or with a higher proportion of fat than will be eaten, may prove expensive even when the price per pound is low.

Large cuts of meat sell at a lower price per pound than the small retail cuts. For example, a whole loin of pork costs less per pound than loin chops, and a hind quarter of lamb costs less per pound than the leg and the loin chops that would come from it. Where adequate home refrigeration is available, it may be wise to buy the large piece and have it divided into cuts for future use.

Boned meat is sold on some markets. With the advance in facilities for holding meat frozen, there is an increasing tendency to bone meat at the packing plant and package and freeze retail cuts for distribution. The price per pound is necessarily higher but waste is minimized. Boneless or boned meat cuts can be comparatively high in price per pound and still be an economical purchase.

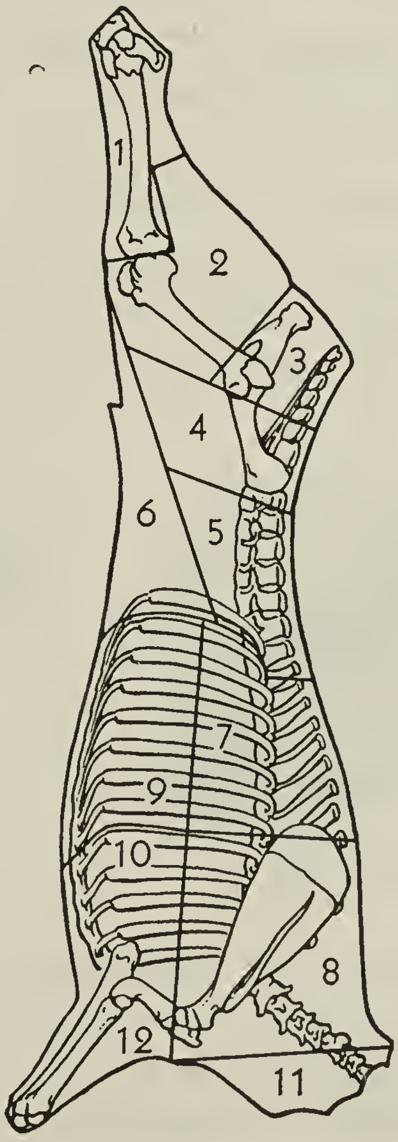
Some general rules to follow in the amounts of meat to buy are these: one pound of boneless meat makes four generous servings, whether it is boned roast, boneless steak, ground meat, liver, sausage, or canned meat; one pound of meat with a small amount of bone, from such cuts as round steak and arm pot roasts, makes three generous servings; one pound of meat with a moderate amount of bone, including most steaks, rib cuts, shoulder cuts, chops, and shortribs, makes two servings.

Cooked meats must sell at higher prices than uncooked. Besides the work involved and the fuel necessary, meat shrinks from 10 to 20 per cent or even more during cooking, depending upon the kind, grade, cut, and the method of cooking.



HIND QUARTER:

1. Hind shank
   - a. Soup bones
   - b. Hock
2. Round
   - a. Round steaks or roast
   - b. Pot roast
3. Rump
   - Roasts or steaks
4. Loin end
   - Sirloin steaks or roasts
5. Short loin
   - a. Porterhouse steaks
   - b. T-bone steaks
   - c. Club or Delmonico steaks
6. Flank
   - a. Flank steak
   - b. Stew or ground beef



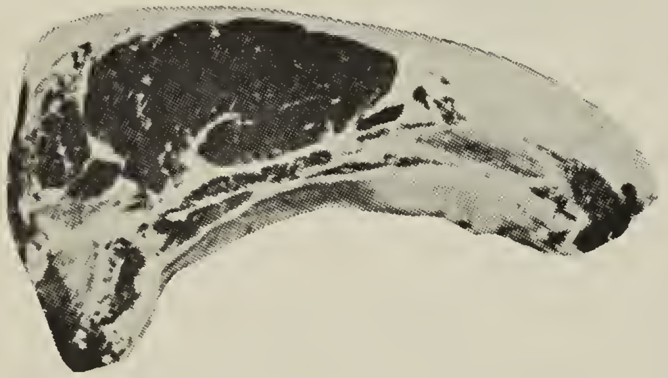
FORE QUARTER:

7. Rib
   - a. Rib roasts or steaks
   - b. Short ribs
8. Chuck
   - a. Chuck rib roasts or steaks
   - b. Arm pot roasts or steaks
   - c. Corner piece
   - d. Stew or ground beef
9. Plate
   - a. Stew, ground beef or boned and rolled pot roasts
   - b. Short ribs
10. Brisket
    - Stew or boned and rolled pot roasts
11. Neck
12. Fore shank
    - Soup bones or ground beef

Wholesale and Retail Cuts of Beef

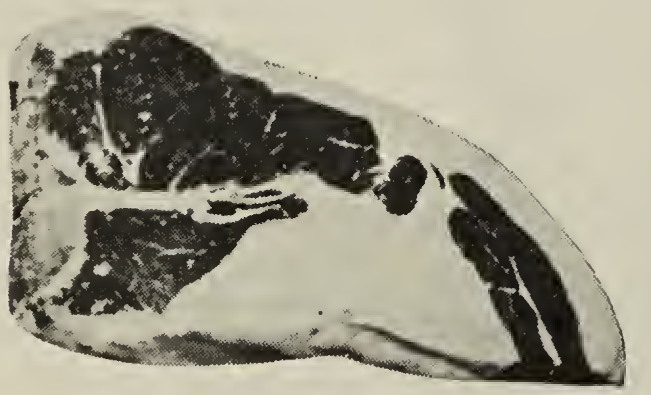
TYPICAL CUTS FROM BEEF AND HEAVY VEAL

Tender Cuts for Broiling and Roasting. Preferred cuts of meat are tender, well flavored, and thick enough to make satisfactory servings. Such cuts come from the loin and rib portions on either side of the backbone. These are suitable for broiling or oven-roasting. In beef the loin is customarily used for steaks and the ribs for roasts.

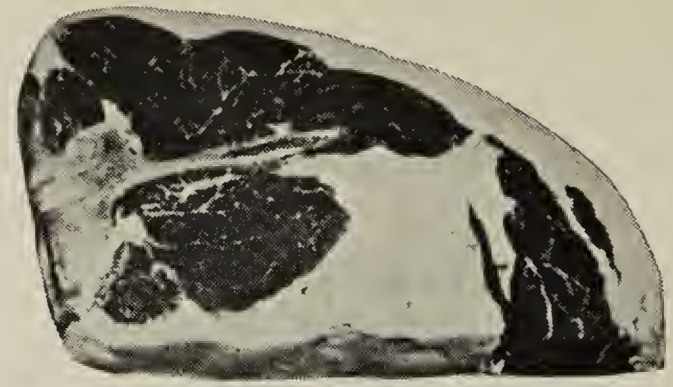

Club Steak

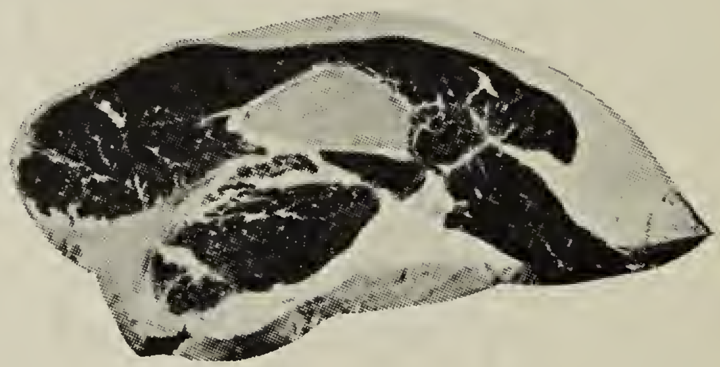
Steaks from the Short Loin. Club steaks are the first off the rib end of the loin. These are small steaks, but the quality is good. One pound should serve two persons.

T-bone steaks are cut from the portion of the loin just behind the club steaks. These steaks contain a portion of the tenderloin muscle below the bone and the backstrap muscle. Cut thick enough for good broiling, this steak should serve two persons. It is more wasteful in fat and bone than the club steak.


T-Bone Steak

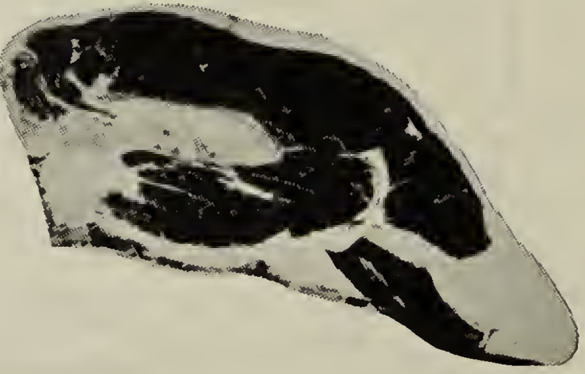
Porterhouse steaks are cut from the hind end of the short loin. The tenderloin and backstrap muscles are larger in this section of the loin, and the less tender tail portion is small. This is considered one of the most desirable steaks, and is priced accordingly in most markets. It should give two servings per pound.


Porterhouse Steak

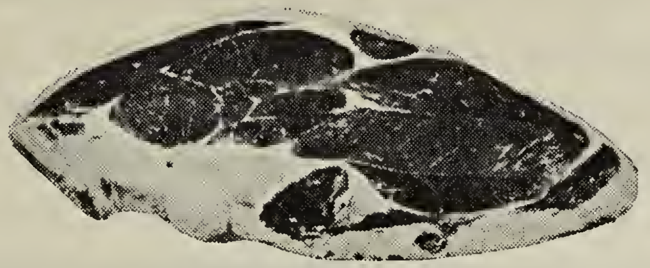

Pin-Bone Sirloin

Steaks from the Loin Ends. The pinbone or hipbone sirloin contains a high proportion of bone and fat and a sizable piece of the tough tail muscle, so that it is least desirable of the sirloin steaks.

The double-bone sirloins are the best of the sirloin steaks. They have a good amount of lean to fat and bone, are of good flavor and sufficiently tender for broiling. Cut at a thickness satisfactory for broiling, these steaks will serve two persons per pound.


Double-Bone Sirloin

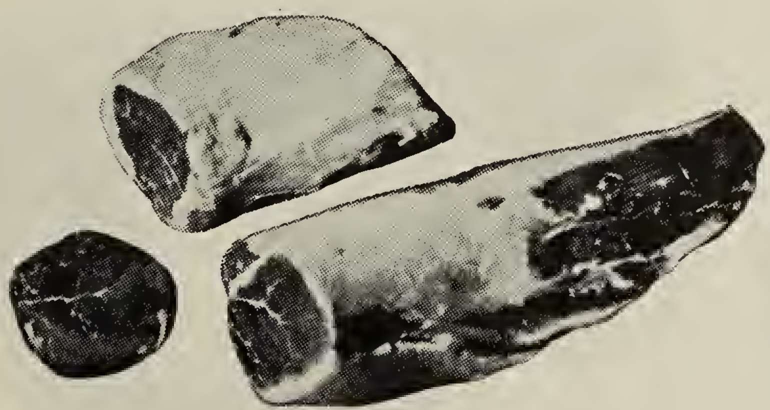
The round-bone sirloins come from the end of the loin near the round. These are excellent except for the muscle at the right. This is the beginning of the sirloin tip, which is less tender than the other muscles in this steak since it is cut with the grain of the meat. This makes it difficult to cook to tenderness. In some markets this end muscle is left on the round and is separated as the sirloin tip. (See page 183.)



Round-Bone Sirloin

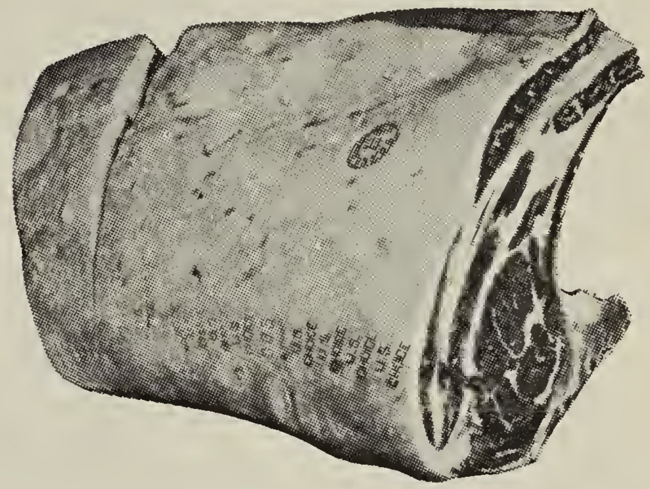
The wedge-bone sirloins (not pictured here) are the last steaks cut from the loin end next to the round. They are similar in appearance to the round-bone sirloins, but have a larger portion of the sirloin tip and so are less tender but an economical cut.

Tenderloin steaks and roasts (filet mignon) are cut from the stripped-out tenderloin muscle. This muscle lies along the backbone and normally appears in the porterhouse and sirloin cuts, and is stripped out only from a low-grade carcass. There is no waste, but these steaks cost more than regular cuts from high-grade carcasses. They lack flavor and so are usually served with flavorful gravies or sauces.



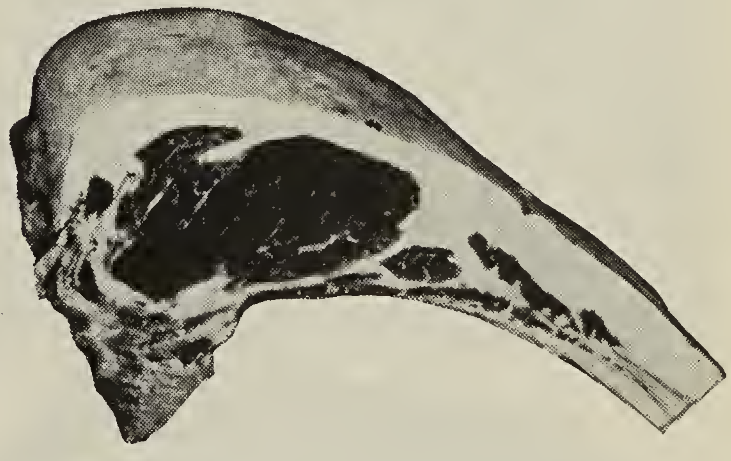
Tenderloin Steak or Roast

Tender Cuts for Oven Roasts. Rib Roasts. While any tender cut of suitable size and shape may be used for oven roasts, rib cuts are preferred. The rib cuts in the grades on the retail market are sufficiently tender for roasting. The lean is well flavored and the eye muscle makes desirable slices.



Wholesale Rib Cut

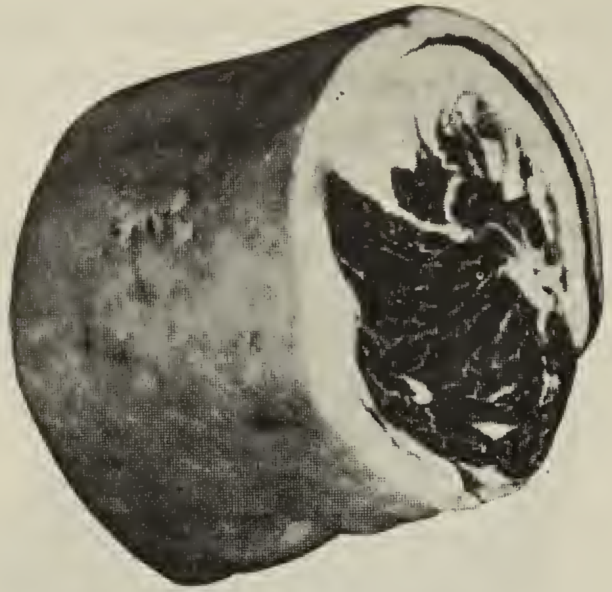
The wholesale cut contains the sixth to the twelfth ribs. Roasts cut from the light end of the rib (eighth to twelfth ribs) are considered the best. Because of the large amount of fat and bone when the rib ends are left long (9 inches), some markets cut these shorter and sell the ends for short ribs. These roasts should be at least two ribs wide for satisfactory cooking.



Standing Rib Roast

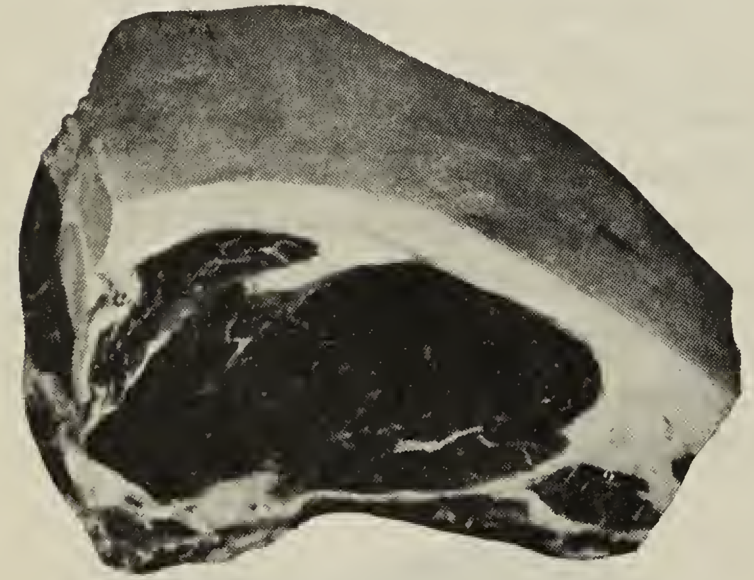
A standing rib roast from the light end of the rib is shown. The arch formed by the ribs holds the roast out of the drippings and makes a rack unnecessary.

A boned and rolled rib roast requires longer cooking time but is easier to carve than a roast with the bone in.



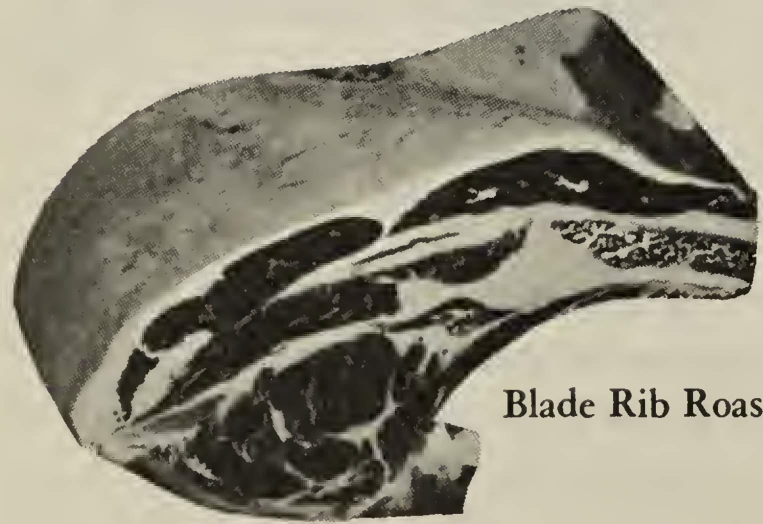
Boned Rib Roast

A hotel-style rib roast has the rib ends and the chyme bones removed. This leaves a nice compact piece for cooking and carving.



Hotel Style Rib Roast

A blade rib roast comes from the heavier end of the rib and contains the sixth and seventh ribs. This roast contains less of the rib eye than those cut from the lighter end of the rib but a larger amount of lean. It is a better buy when economy is more important than high quality.

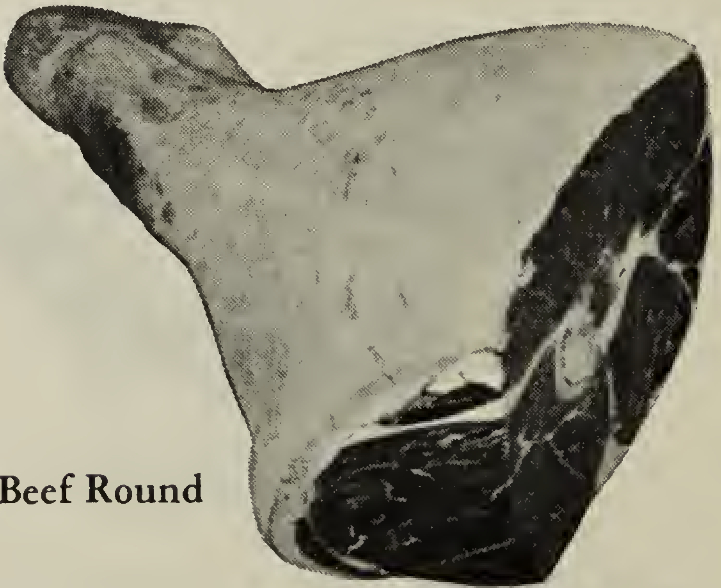


Blade Rib Roast

Less Tender Cuts of Beef and Heavy Veal (Used for Braised Steaks and Pot Roasts). The chuck, the rump, and the round have meaty portions that contain a large proportion of lean. These are used for steaks and pot roasts. These cuts vary in tenderness, and in all except the top grades should have moist-heat cookery for tenderness. These portions are cut according to the use to which they are to be put.

Rump

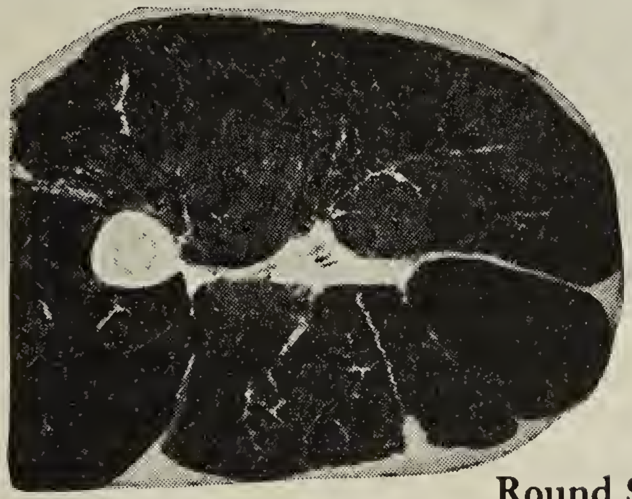
The **rump** is the triangular portion between the loin and the round. It contains one end of the hip bone as well as the ball-and-socket joint where the upper leg bone fits into the hip bone. Boned, it makes desirable steaks and roasts. These are of good size for small families, of good flavor, and



Beef Round

from well-aged beef of choice grades may be roasted or broiled. The lower grades should be braised or pot-roasted.

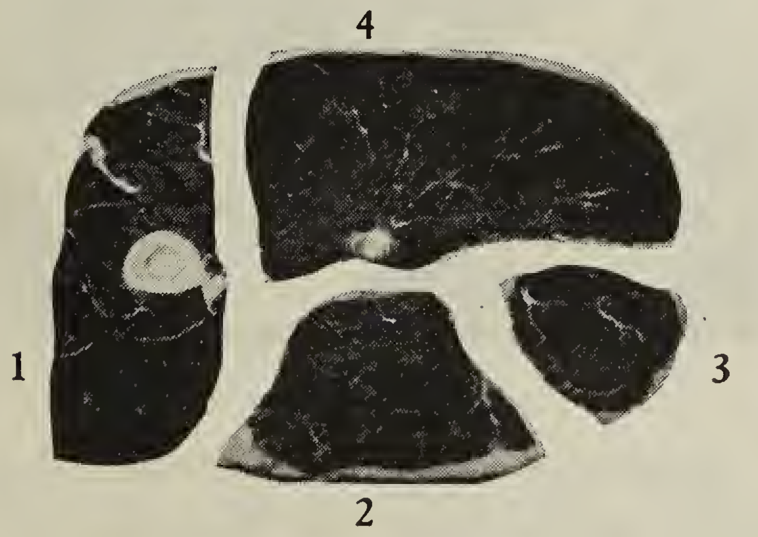
The **round** is popular because of the high proportion of lean to fat and bone. It is well flavored but less tender than the loin and rib portions. On markets that demand "meat" rather than tenderness the round steaks may sell at the same price as the steaks cut from the loin that are more tender but yield less lean to fat and bone.



Round Steak

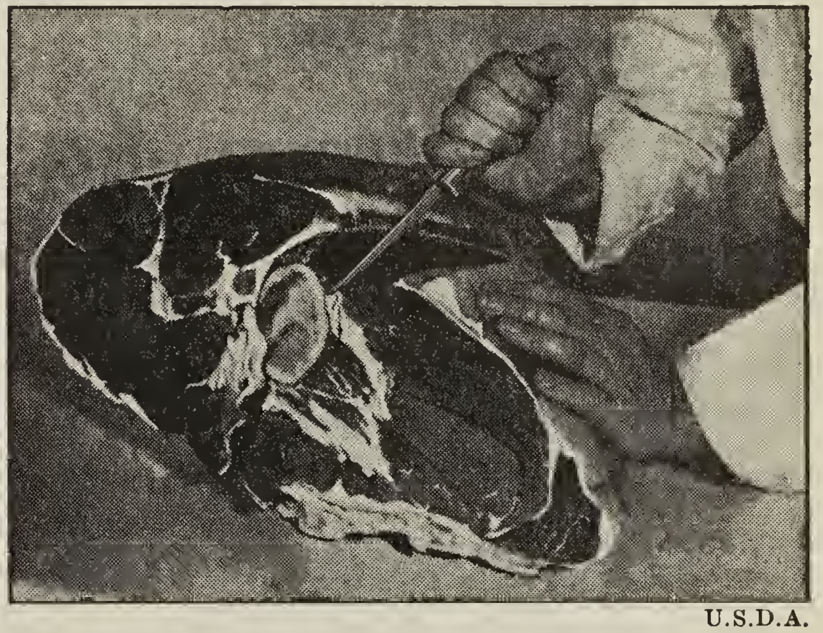
Round Steak. The first cuts off the exposed face of the round are the most desirable.

The muscles in this cut vary in tenderness. (1) The sirloin tip and (4) the top round are more tender than (2) the bottom round and (3) the eye of the round. From choice-grade carcasses the tender muscles from the first cuts may be cooked to tenderness by low-temperature broiling or roasting. The more tender portions from good or commercial carcasses may be lightly broiled if cut thin and cubed or beaten to break the connective tissue. These are sometimes called minute steaks.



Round Steak Divided

The sirloin tip muscle is frequently boned out. From meat of good or better grade it can be oven-roasted or broiled at low temperature, since it is cut across the grain.

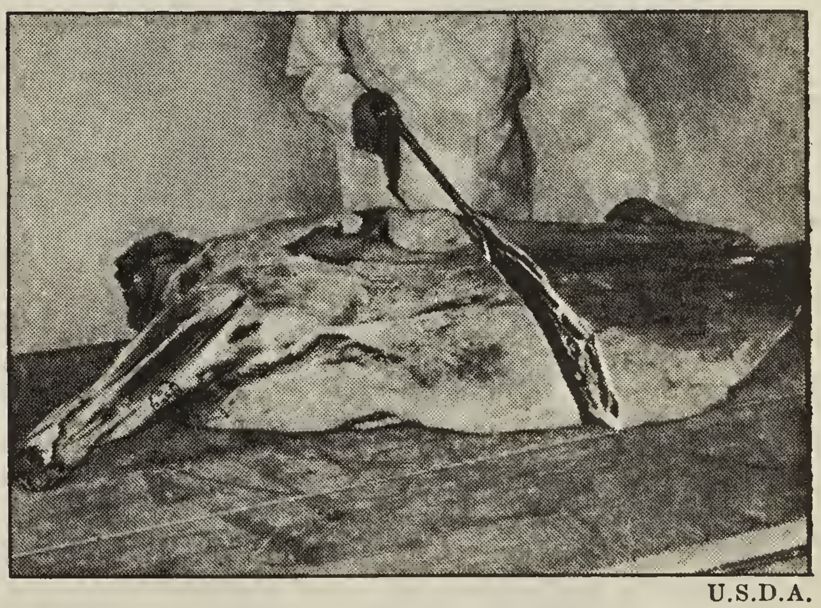


U.S.D.A.

Removing Sirloin Tip from Round

The less tender muscles and the cuts from the center and the lower round should be braised as steaks or cut thicker for pot roasts or ground for hamburger.

The **chuck** contains the first five ribs, the upper back and neck bones, the shoulder bone and joint, and the arm bone. **A chuck rib** or **blade roast or steak** is the first cut taken from the rib end of the chuck. In higher grades the eye muscle of this cut tends to be tender. The shoulder blade is wider than in the blade rib cut and interferes with the carving unless removed. The outside

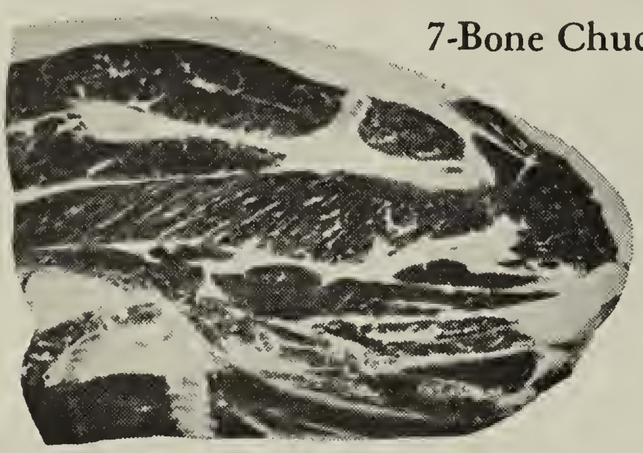


U.S.D.A.

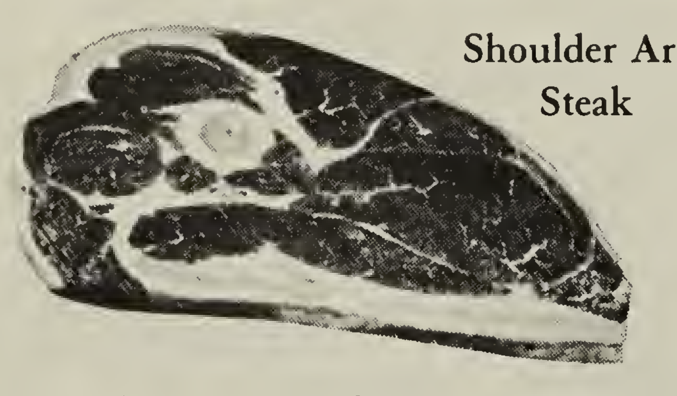
Separating Chuck from Rib Cut

muscle is more tough than the eye portion and should be removed with the blade and cooked separately. If the outside fat is rolled over the exposed eye muscle, this portion can be oven-roasted.

The 7-bone chuck cut comes from the thick part of the chuck near the neck. This cut contains more lean to bone than other portions of the chuck and makes a good pot roast.

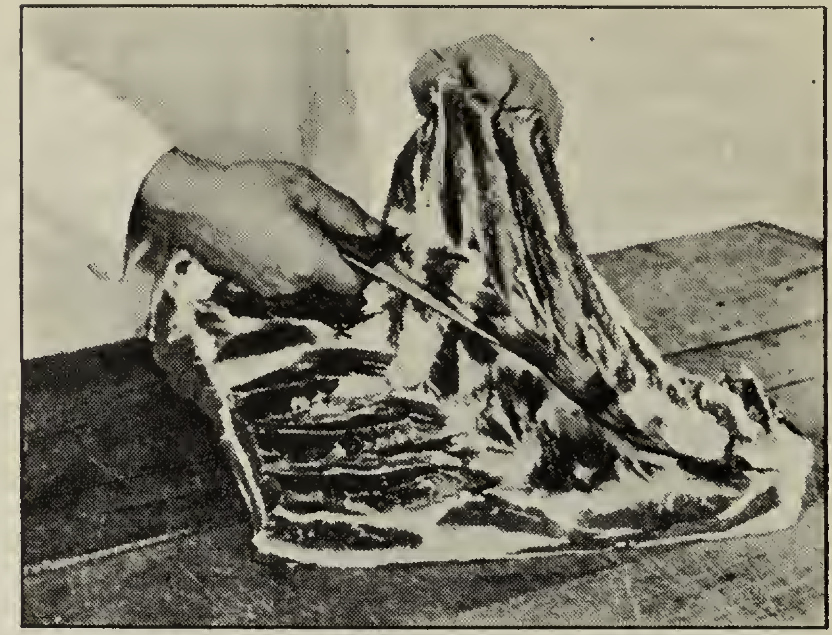

7-Bone Chuck

The shoulder arm cuts come from the lower portion of the chuck. These have good flavor and are desirable for braising and pot-roasting. The illustration shows a shoulder arm steak. While the bone is shaped like that in a round steak, the muscle structure is quite different. The shoulder arm should cost less per pound than the round; so learn to know the difference between an arm and a round steak.


Shoulder Arm Steak

The flank, plate, and brisket cuts require cooking with water or steam for tenderness. The lean is well flavored and palatable when properly prepared. In the higher-grade carcasses these cuts may contain an excess of fat. The thick portions are used for pot roasts, and thin portions not too fat may be boned and rolled for pot-roasting or cut into portions for stews. Trimmings are ground for hamburger. Twenty-eight per cent of fat is allowed in market hamburger.

The flank steak is a fair-shaped muscle which lies inside the flank, one on either side. They are stripped out rather than cut. These steaks are well flavored. The muscle fibers are coarse and run lengthwise the steak, so that these steaks must be prepared by braising. Less flavor is lost if they are pounded to break connective tissue binding the muscle fibers instead of being cut across the fibers before cooking.


U.S.D.A.

Boning Brisket

U.S.D.A.

Flank Steak

Soup Bones. Fore and hind shank bones contain much cartilage and connective tissue which can be softened only by long, slow cooking in water. These portions are used for soups. The long, slow cooking extracts gelatin from the bone and connective tissue and flavor from the meaty portions. The meat can be served in the soup or ground and used in well-seasoned hash or croquettes.

CUTS OF VEAL AND LAMB

Baby veal is the flesh of young animals, ranging in age from three to fourteen weeks. These young animals come from dairy herds and have been largely milk-fed. Carcasses from animals three to ten months old are known to the trade as calves but may reach the retail market as veal. These usually come from range cattle and have been grass-fed. Some may be finished on grain, in which cases the carcasses contain more fat and are larger than typical veal. Large veal carcasses are cut like beef, but corresponding cuts are smaller.

Lamb and baby veal carcasses usually are not split down the back like large veal, beef, and pork. The wholesale cuts are referred to as saddles.

The hind saddle contains the leg, loin, and flank portions and the fore saddle, the hotel rack (rib) chuck, and breast. (See page 186.)

Lamb and veal cuts are small and in general are tender. Lamb is generally broiled or oven-roasted.

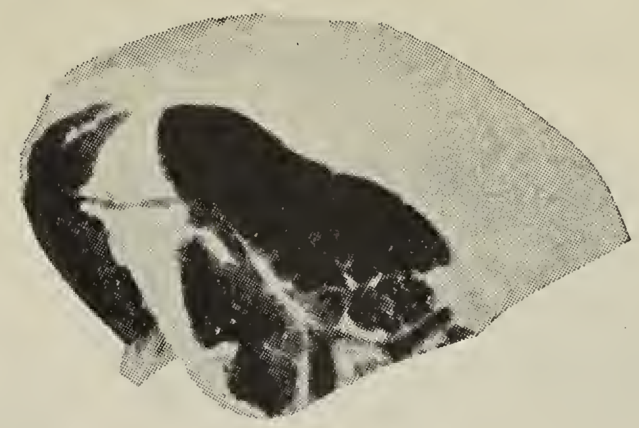
Veal is less fat than lamb and contains more connective tissue. While veal cuts may be broiled and oven-roasted, both methods should be done at low temperatures. Braising is more satisfactory. Preliminary searing is avoided since it tends to toughen the soft connective tissue. Veal is more tender when cooked to the well-done stage.

Veal and Lamb Chops. Lamb and veal cuts for broiling are called chops because of the small size.

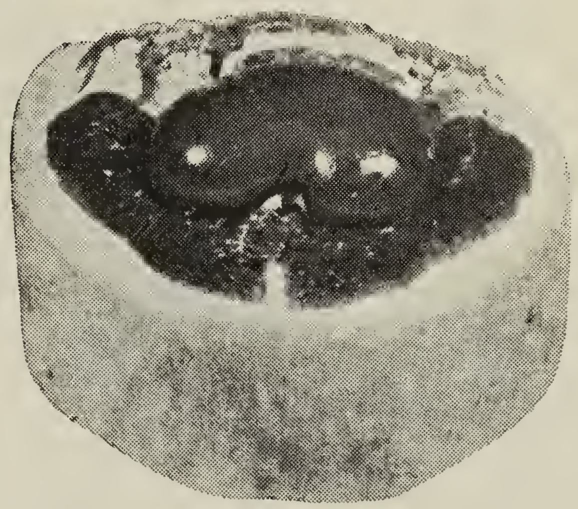
Loin chops are preferred and usually are the most expensive. They have a good proportion of tender, well-flavored meat to fat.

English lamb chops are double-cut loin chops, boned and rolled. Some English chops are rolled about a small portion of the kidney.

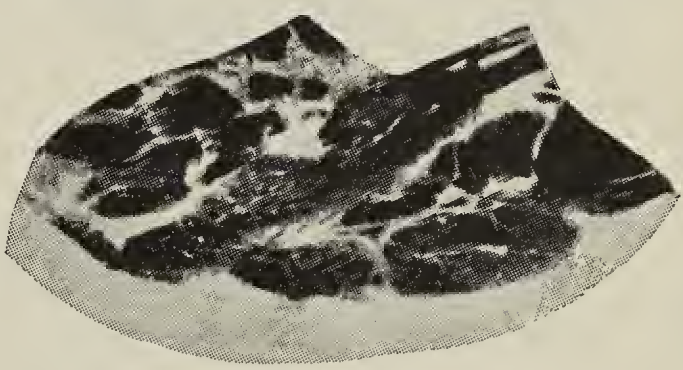
Shoulder chops are well flavored and sufficiently tender to be cooked by careful broiling. While not as choice as the other two cuts, they usually cost less.



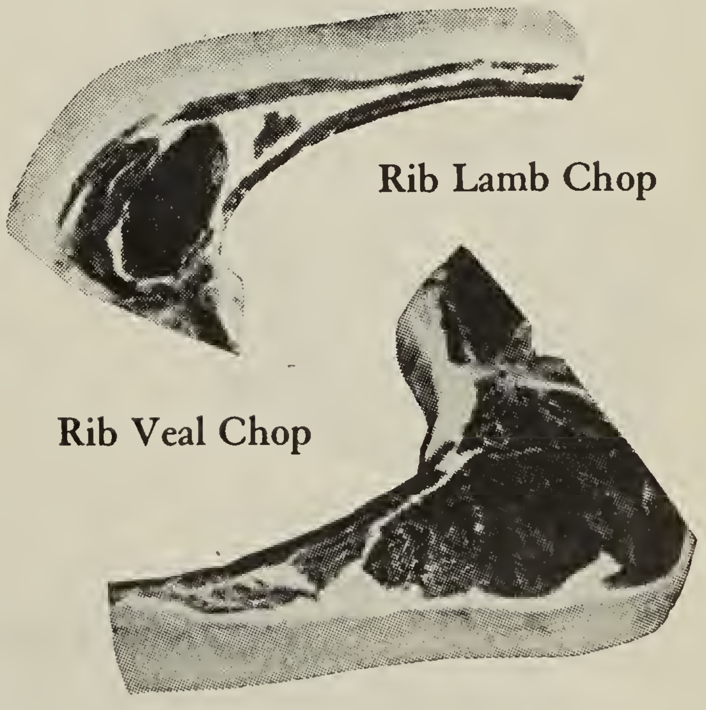
Loin Chop



English Lamb Chop

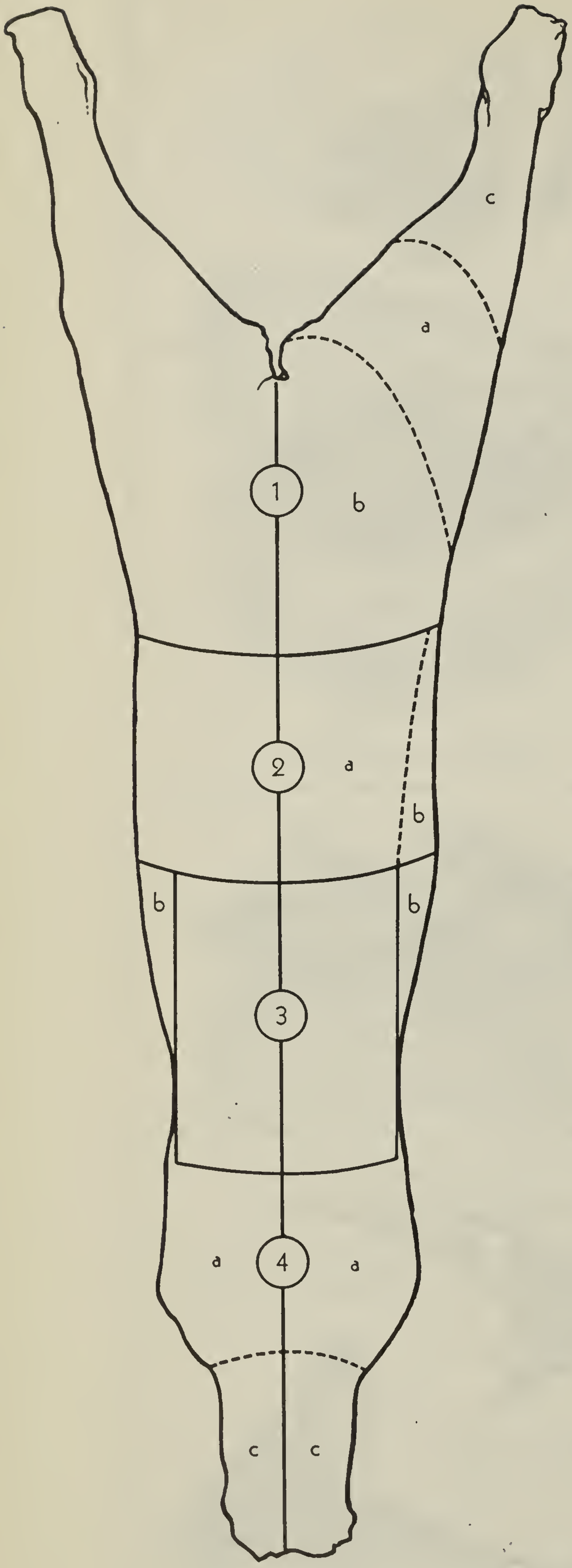


Shoulder Chop



Rib Lamb Chop

Rib Veal Chop

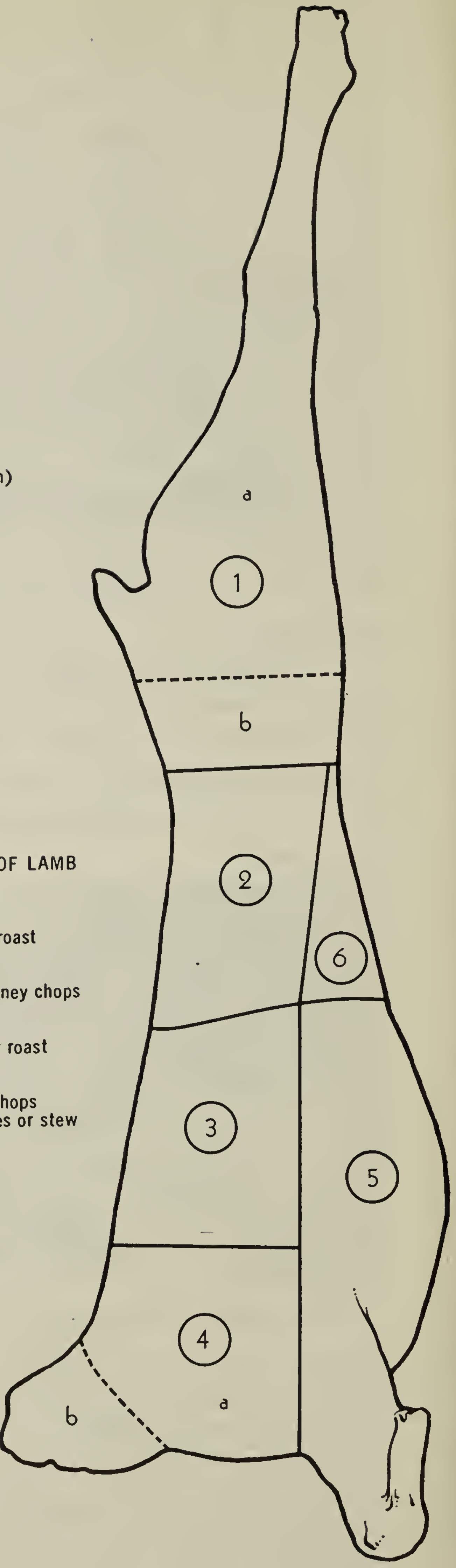


KEY TO CUTS OF VEAL

1. Leg
   - a. Cutlets
   - b. Roast
   - c. Stew
2. Loin
   - a. Loin and kidney chops
   - b. Stew
3. Hotel Rack
   - Rib chops
4. Shoulder (shank and breast not shown)
   - a. Roasts
   - b. and c. Stew

KEY TO CUTS OF LAMB

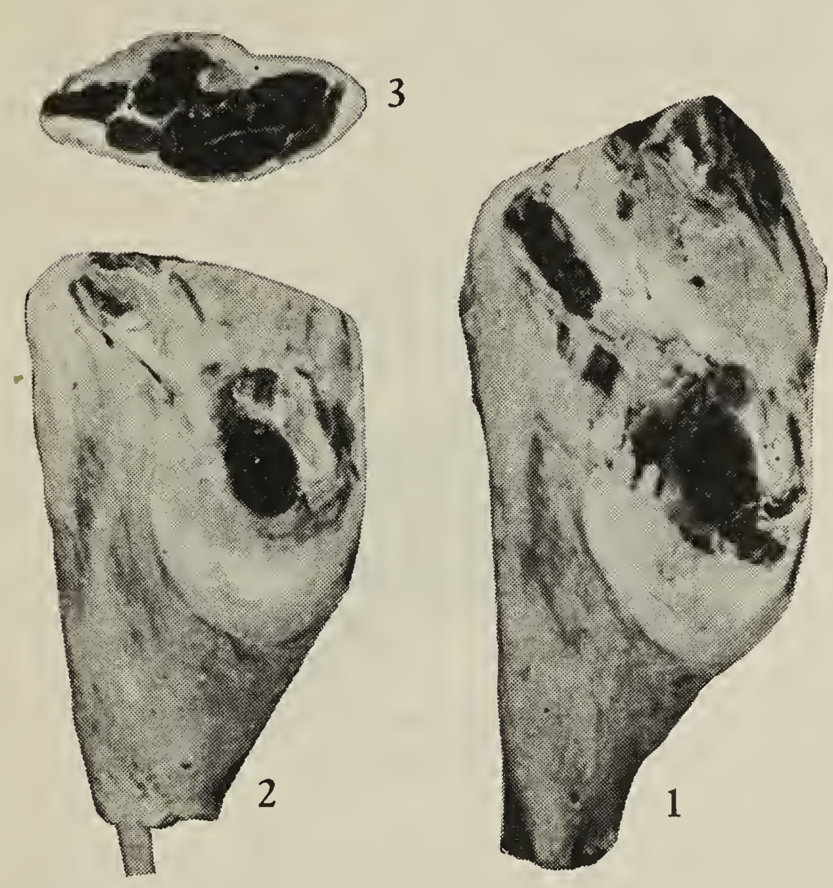
1. Leg
   - a. Roast
   - b. Chops or roast
2. Loin
   - Loin and kidney chops
3. Hotel Rack
   - Rib chops or roast
4. Chuck
   - a. Roast or chops
   - b. Neck slices or stew
5. Breast
   - Stew
6. Flank
   - Stew



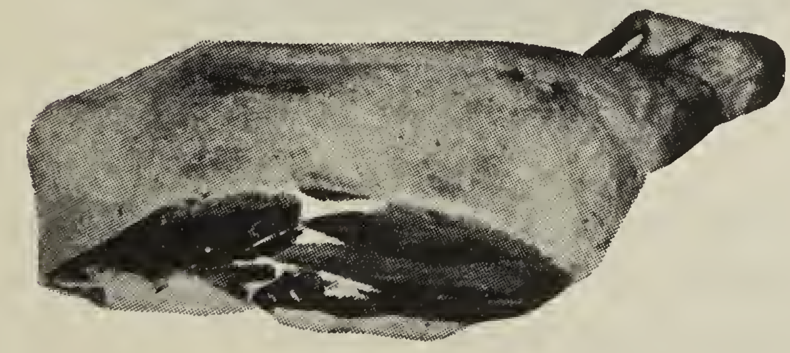
Wholesale and Retail Cuts of Veal and Lamb

Rib chops contain a small amount of lean in proportion to bone. They are a better buy when the rib bone is cut short.

Veal and Lamb Roasts. The rounds (legs) are tender enough in the young animal for an oven roast. This cut is well flavored, slices well and yields a good proportion of lean. The illustration shows the ways of trimming a leg of lamb. 1 is long-cut loin, 2 has had chops (3) removed, and the bone end is Frenched.

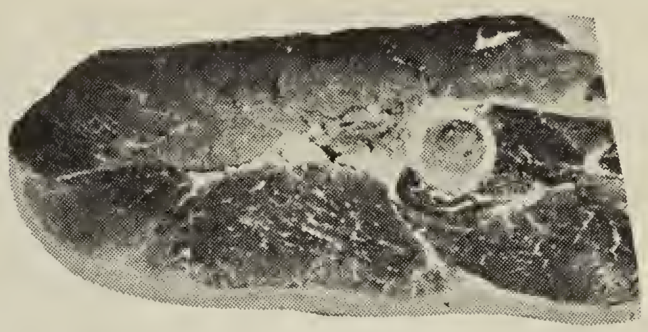


Legs of Lamb



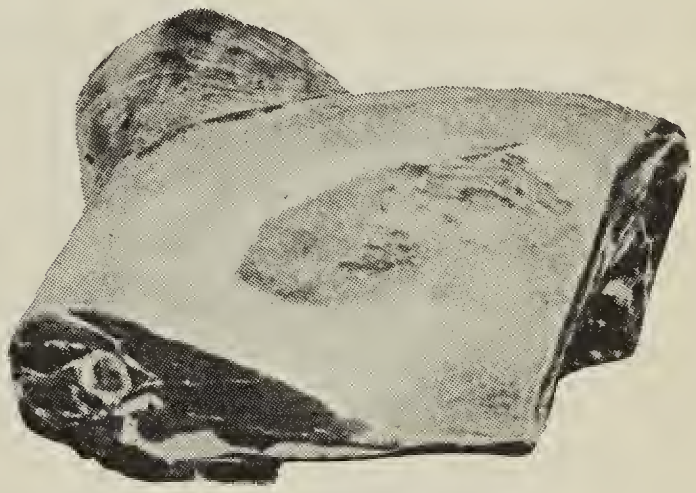
Leg of Veal

This leg of veal corresponds to the round and the rump in beef. From small carcasses it may be used as is for a large roast, or the rump portion may be removed for a small roast, and the round may make a roast or steaks (cutlets) according to demand.



Veal Round Steak

Shoulders of lamb or veal are square-cut. These may have the shoulder bone removed and the backbone cut between the ribs for ease in carving. Stuffing frequently is put into the space left after removal of the bone. This extends the meat dish and adds its flavor to the meat during cooking.



Square-Cut Shoulder

Cushion Shoulder

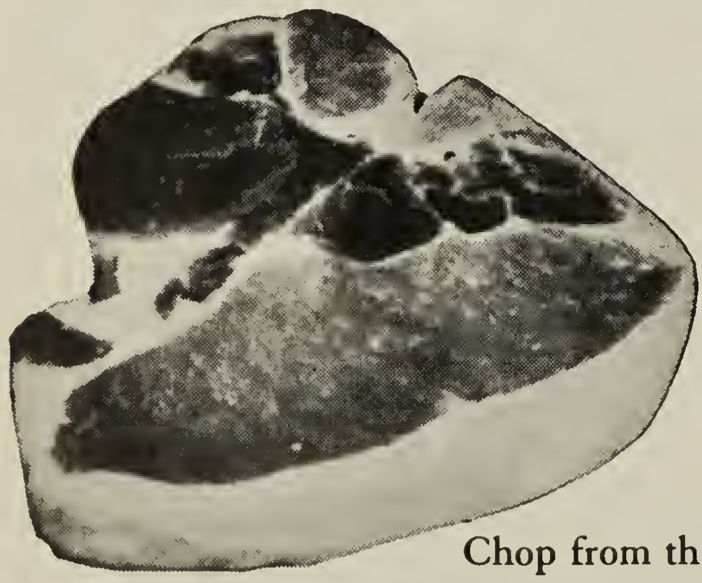
Or the shoulder may be completely boned and stuffed to form a cushion shoulder, or rolled with or without stuffing.

TYPICAL PORK CUTS

Hogs are used fresh as pork, cured as ham and bacon, and to supply the household fat, lard. The division of the carcass into cuts is designed to separate the portions most suitable for these different uses.

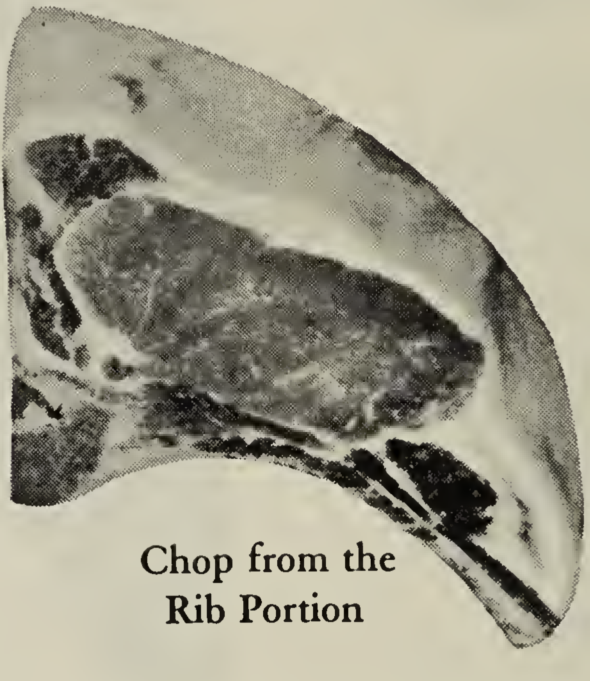
A large share of the pork produced in this country is cured by salting and smoking. Originally developed as a means of extending the farm meat supply over the year, cured hams, cured shoulders, and bacon now form an important group of meats into which much of the pork slaughtered in industrial plants goes. On the farm the hams, shoulders, bacon, and meaty portions from the cheek jowl are put aside to be cured. The backbone and the spare ribs and the stripped-out tenderloins are used fresh. The strip of fat down the back may be salted as "fat back" or go into lard. The portions left over are divided into fat and lean for lard or sausage. Some of the sausage is smoked to add to its flavor and extend its life.

On the retail market meaty portions with a minimum of fat are preferred for fresh use. While fresh hams and shoulders are found on the retail market, the fresh cuts most frequently used in the retail trade are the loin and spare ribs, cuts not suitable for curing.



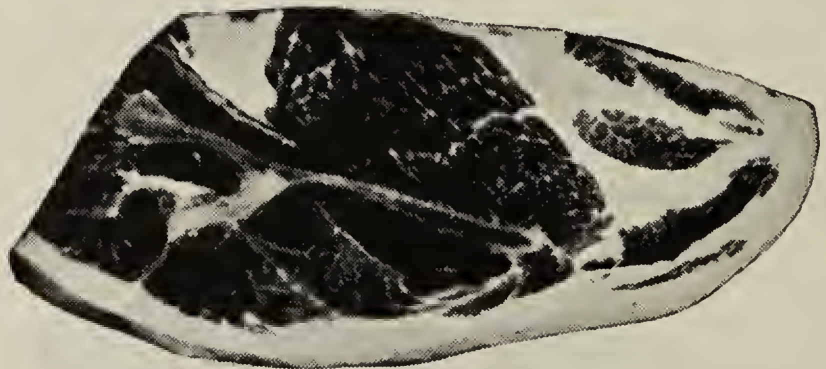
Chop from the
Short Loin Portion

The wholesale pork loin is a long cut that extends along the backbone from the pelvic bone to the shoulder blade. It contains the backbone, the tenderloin, and the meaty portion along the loin and rib. The chops or roasts cut from a wholesale pork loin vary in quality with the portion from which they are cut. The most desirable and the highest in price are the center-cut chops. These correspond to the short loin and rib chops in lamb or veal.



Chop from the
Rib Portion

The end chops contain more bone. These correspond to sirloin cuts at one end and the shoulder cuts at the other. Roasts and chops from this portion serve three or four persons per pound.



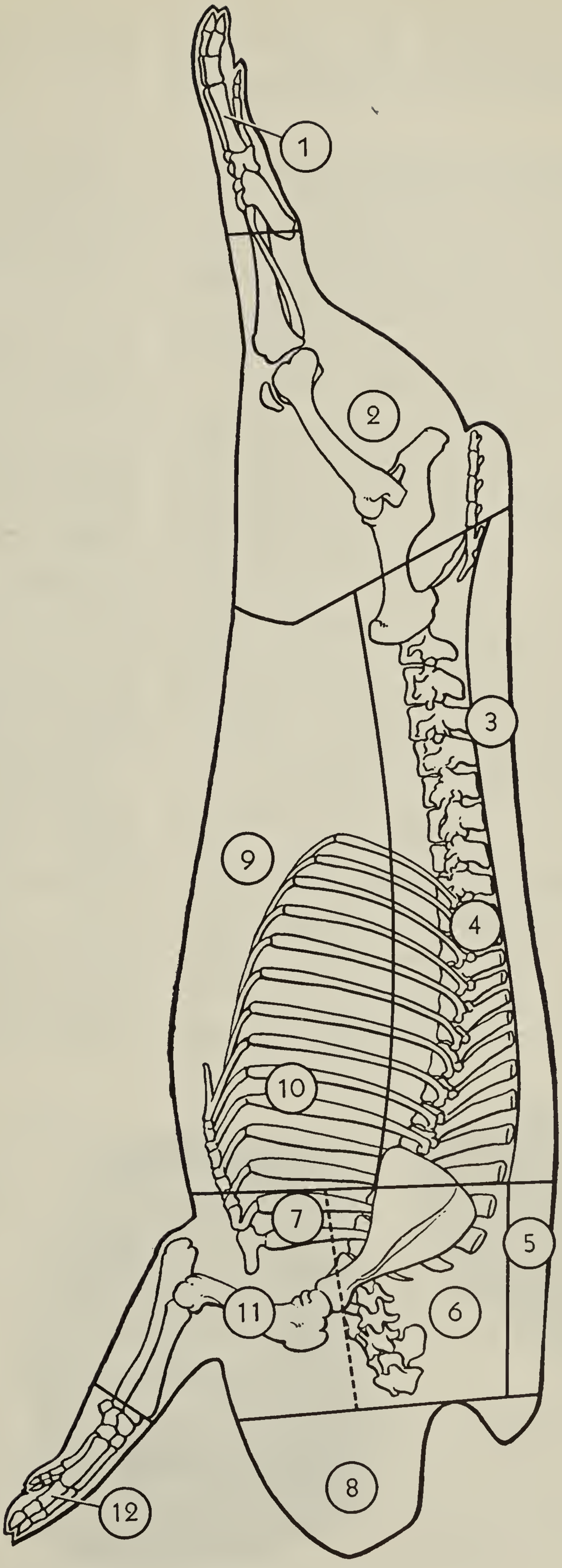
Chop from the Sirloin Section

The spareribs on the retail market are stripped off the bacon belly and contain a large amount of bone to lean.

Cured ham is sold whole, as a half ham, or sliced. The butt half contains more lean than the shank half and costs more per pound, but is more difficult to carve. The center portion is preferred for slicing and costs more per pound than either whole or half hams.

Skinned fresh and cured hams cost slightly

1. Foot
2. Ham
3. Fat back
4. Loin
5. Clear plate
6. Boston
7. Neck bones
8. Jowl
9. Bacon belly
10. Spareribs
11. Picnic
12. Foot



Location of Pork Cuts and Their Relation to the Skeleton more per pound than those sold with the skin on.

Tenderized hams have been partially cooked during smoking. All hams require thorough cooking except those labeled as cooked.

Cured picnics, sometimes called picnic hams, are cut from the lower portion of the shoulder. These sell for less per pound than ham but contain less lean meat and the quality of the meat is less desirable than that in the ham. Because this cut is difficult to carve, it often is boned before cooking.

The Boston Butt is cut from the upper shoulder. It is boned before curing, and makes a compact piece of convenient size for a small family. It may be sliced and fried or roasted.

Bacon is the preferred breakfast meat. Bellies from the light and medium carcasses are used. Hogs are bred to yield the strips of fat and lean that indicate quality in bacon.

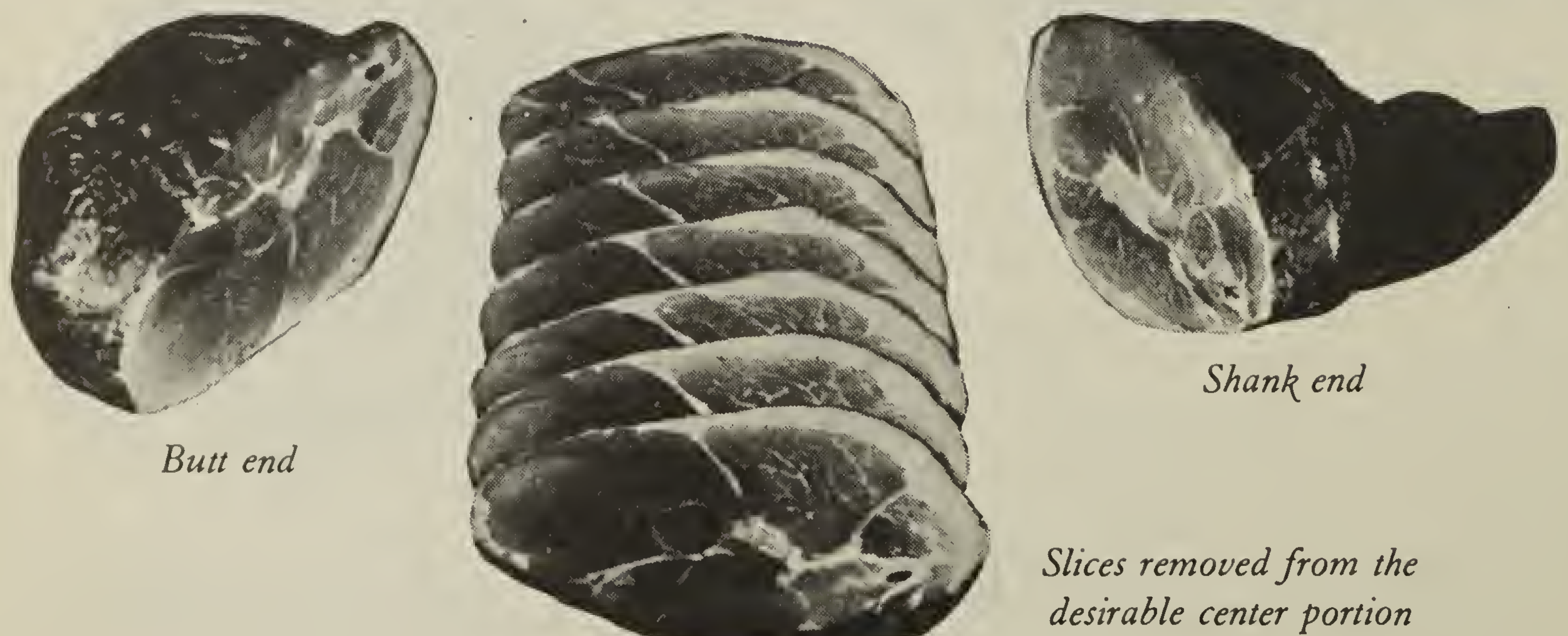
The heavy bellies go into salt pork.

Bacon may be bought in the piece or sliced. The price per pound is less in the piece than sliced and it keeps better in the piece, but it is difficult for an inexperienced person to slice bacon evenly. Some retailers buy bacon by the side and slice it for the consumer; others handle only the bacon sliced and packaged by the packer. The usual pound package contains twenty to forty slices, depending upon the thickness. Thin sliced bacon runs forty slices to the pound.

CARE AND STORAGE

Meat is a highly perishable food. Its palatability and high nutritive value must be protected from the time of slaughter until it is eaten. To prevent deterioration, it is chilled at the processing plant for 48 hours after slaughter at temperatures just above freezing. It is shipped in refrigerated cars or trucks. Both wholesale and retail markets keep meat under constant refrigeration. There is a growing tendency to market fresh meats in frozen form. These are kept at frozen storage temperatures until sold to the consumer. The same good care should be given to meat after it is purchased by the consumer as it has had previously. Proper refrigeration is of first importance.

Refrigeration. All fresh, smoked, and cooked meats should be kept under refrigeration. Ideal temperatures for fresh meats are 33° to 36° F., with a relative humidity of 80 to 90 per cent. Smoked meats and cooked meats may be stored at slightly higher temperature but always should be under refrigeration. A temperature of not



Butt end

Shank end

Slices removed from the desirable center portion

Ham Cuts

above 40° F. should be maintained in the portion of the home refrigerator where meat is stored.

As soon as meat is delivered, its outside wrappings should be removed and it should be placed in the coldest part of the refrigerator, loosely covered with waxed paper to prevent drying. Many modern refrigerators have a special meat compartment in which proper temperature and humidity are maintained.

Ground meats and, next, meat cut in small pieces spoil most rapidly. To prevent deterioration, meat should be stored in as large pieces as possible. Since ground meat is particularly perishable it should be ground or purchased on the day it is to be cooked. When it is necessary to hold ground meat for more than 24 hours it should be prepared for cooking and then frozen.

Variety meats (page 210) spoil more rapidly than muscle meats. They should be used promptly after delivery, held in frozen storage, or precooked. Brains and sweetbreads, especially, should be kept frozen or precooked by simmering in seasoned, acidulated water before storing.

Cooked meats, drippings, gravies, and meat soups should be chilled immediately after the meal, covered closely, and stored under refrigeration.

Frozen meats should be kept frozen, and stored at as near 0° F. as possible. They should not be defrosted and refrozen. When only a part of a container of frozen meat is needed, this amount should be removed, and the remainder left in freezing storage. Frozen meats may be defrosted in the refrigerator, at room temperature, or during cooking if the cooking temperature is very low.

Home Freezing. For preservation of fresh or cooked meat in the home freezer, the meat should be wrapped and sealed in moisture-proof cellophane, and carefully labeled as to kind, cut, weight, and method of cooking. Uncooked meats should be prepared for cooking before wrapping for the freezer. Meats should always be frozen below 0° F. Lower temperatures are desirable. After meat is frozen solid it may be stored at 0° F.

PREPARATION FOR COOKING

As brought out before, there is a growing tendency to prepare meat in the processing plant so that it will be ready for cooking. This eliminates any preliminary preparation for cooking in the home. Meat cuts which have not been completely prepared for the oven, broiler, or cooking pan may need some trimming. Meats killed on the farm for home consumption will have to be cut and trimmed for cooking.

Trimming and Cutting. Thin or ragged pieces should be trimmed from the thick or chunky cuts to eliminate waste during cooking. Tender meat should be separated from the less tender in order that proper cooking methods can be used. The meat should be so prepared for cooking as to make carving easy. For example, if it is a shoulder cut, the shoulder blade should be boned out so that the meat may be sliced in attractive servings. With rib or loin cuts, the backbone should be separated from the ribs by sawing the ribs close to the backbone. The backbone then becomes loosened during cooking and may easily be removed for carving.

Although meat cuts need a covering of fat to prevent evaporation and keep them juicy during cooking, it may make for economy to trim off excess fat before cooking.

Lean trimmings, with some of the fat, should be ground for use in meat loaves, patties, meat balls, meat sauces, and various casserole dishes. Lean trimmings also may be added to the soup kettle for use in soups, gravies, or sauces.

Fat trimmings should be ground or chopped and rendered at low temperature, then strained through clean cloth, cooled at room temperature, covered tightly, and stored in the refrigerator for use in cooking.

Bones taken from meat should be sawed in three-or four-inch lengths and used for soup. Even well-trimmed bones give both flavor and food value to soup and never should be wasted; they are paid for in the market; they should be taken home and used.

If the meat is properly handled it needs no cleaning before cooking. Meat never should be washed, as this results in a loss of both flavor and soluble nutrients. If necessary, it may be wiped with a damp cloth.

Defrosting Frozen Cuts. There are three ways of defrosting frozen meat cuts: (1) in the refrigerator, wrapped, (2) at room temperature, wrapped, and (3) during cooking.

From the standpoints of total shrinkage during defrosting and cooking and of the palatability of the cooked meat, it makes little difference whether meat cuts are defrosted before or during cooking. From the standpoint of cooking time and fuel consumption, however, complete defrosting before cooking is advised for at least the large chunky cuts. A big advantage in favor of defrosting before cooking is that the meat is cooked in the same ways, at the same temperatures, and for the same lengths of time as fresh meat which has not been frozen.

Refrigerator defrosting is advised if time permits. There is somewhat less drip with refrigerator-defrosted meat than with that defrosted more rapidly at room temperature.

It is best to defrost without removing the wrapping from the meat. If the wrapping is removed a good circulation of air is needed during the defrosting period to prevent the accumulation of surface moisture and the growth of slime-forming bacteria.[1]

The defrosting time varies with the weight, shape, and thickness of the cut of meat, as well as with the temperature of defrosting. The thinner the cut the shorter the defrosting time. At a refrigerator temperature of 45° F. a 2-inch porterhouse steak, frozen solid, will require close to 24 hours to defrost, while a half-inch porterhouse will defrost in about four hours. The higher the temperature used in defrosting, the shorter the time. Frozen steaks, 1-inch thick, which will defrost in three to four hours at room temperature will require about 18 hours in the refrigerator. An electric fan blowing across the meat decreases the defrosting time.

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[1] Col. Paul P. Logan, *The Cooking of Frozen Foods*. News Bulletin, National Restaurant Association, December, 1946.

XIV · Meat Cookery

PRINCIPLES OF COOKERY

Cooking brings about many changes in meat. Heat improves the appearance and palatability of meat, but causes shrinkage and affects, to some extent, its nutritive value. During cooking there are changes in the pigments and proteins; there may be some loss in the unstable and soluble vitamins. The water evaporates, the fat melts, and both fat and meat juice escape and form drippings, or combine with the cooking liquid. Research has established certain principles or facts which may serve as guides to good meat cookery.

The objectives in cooking meat are to change the color of the meat, to retain and develop the natural flavor of the meat, and to make the meat tender, if necessary. It is desirable to do this by methods that keep shrinkage at a minimum, and conserve the nutritive value of the meat.

Color Changes. Color in meat is due to pigments in the muscle. During cooking by the usual methods, dry heat develops varying degrees of brownness on the surface of meat as a result of the breaking down of the fat, protein, pigments, and other constituents. Moist heat also breaks down the color pigments in the muscle tissue of the interior of the meat, causing definite color changes. The color of the lean changes progressively from that of the uncooked meat to that of well-done meat. In a loin of pork, the color progresses from a light pink to nearly white; while in a fresh ham, the well-done color is a light gray or tan. For beef and lamb the color changes from a bluish red to a bright-rose red, a light pink, and finally brownish gray.

At a temperature of approximately 150° F. the hemoglobin is broken down to hematin and other products. The color change from red to brown or gray may be complete at 160° F., especially when low cooking temperatures are used. Again, all pink color may not have disappeared until a temperature of 175° to 180° F. has been reached. The rate at which the pigment changes color is affected not only by the rate of heating, but also by the kind of meat, the grade or quality, and the amount of aging it has had. Hence, the color of beef roasts may vary somewhat even though they are cooked to the same internal temperature.

Table XXXIV gives the color changes which take place in lean meat as it cooks, with the corresponding stage of doneness and the range in internal temperature of the meat at each stage. The internal temperature, therefore, is a guide to the color of the inside of meat or to its degree of doneness. While these color changes are taking place in the lean of the interior of meat, the color of the interior fat may change but little.

Table XXXIV · *Temperatures at Which Color Changes Take Place in Meat*

Color	Stage of Doneness	Internal Temperature of the Meat, °F.
Bright pink	Rare	122 to 140
Pinkish brown	Medium	140 to 160
Grayish or light brown .	Well done	160 to 180

Tender Meat. In the cooking of meat, there is maximum development and retention of natural meat flavor when dry heat is applied, by the methods known as roasting, broiling, pan-broiling, griddle-broiling, and frying.

Unfortunately, only tender kinds and cuts of meat may be cooked by these dry-heat methods which conserve and develop the maximum meat flavor. Dry-heat methods of cooking bring about only a small amount of tenderizing, except in moderately tender roasts and thick steaks cooked at low temperatures.

Less Tender Meat. When meat is not tender, in order to make it palatable, it must be made tender during cooking. This can be accomplished with moist heat, using the methods of cooking known as braising and stewing or cooking in liquid. Moist-heat cookery, in steam or liquid, softens the collagen of the connective tissue, thus making the meat tender.

When moist heat is used for cooking meat, tenderness is obtained at some sacrifice of flavor and soluble nutrients in the meat itself. To compensate for this, an effort should be made in cooking the less tender cuts to develop the flavor of the meat dish. The meat should be browned slowly on all sides for developing meat flavor before applying moist heat, and seasonings should be used to add flavor. Use should be made of the pan drippings or broth in which the meat is cooked for gravy or sauce to retain the flavor and the nutrients leached out of the meat into the drippings.

Less tender meat may be made tender by breaking up the connective tissue by pounding, scoring, cubing, or grinding. After it is made tender by mechanical means, it can be cooked by dry heat, roasting, broiling, pan-broiling, griddle-broiling, or frying, just like any tender cut.

Cooking Losses. Heat shrinks muscle fibers, so that a piece of meat tends to decrease in size during cooking. The shrinking squeezes out the soluble meat juices (extractives), and as the meat becomes hot the fat melts and collects in the pan or the cooking water. These juices and fat make up the drippings that collect when meat is roasted. In addition to the loss in weight in the drippings, there is loss in weight from the evaporation of water and volatile flavors from the surface of the meat when it is cooked uncovered in dry heat.

Keeping shrinkage at a minimum is of great importance in meat cookery. Shrinkage not only affects the weight of the meat, but it also affects its appearance and its palatability, especially its juiciness and tenderness.

FACTORS AFFECTING SHRINKAGE. Two factors are important in keeping cooking losses low.

The higher the temperature at which the meat is cooked, the greater the shrinkage.

The higher the internal temperature to which the meat is cooked, the greater the shrinkage.

COOKING TEMPERATURE. Low cooking temperatures prevent losses in cooking, whether the method used is roasting, broiling, frying, braising, or stewing. From 15 to 20 per cent of the meat shrinkage occurring in the kitchens of many homes and institutions, as a result of high cooking temperatures, can be prevented by the use of low temperatures.

The illustrations of paired[1] or other very similar meat cuts which follow are dramatic proof that low cooking temperatures pay. The illustrations show the meat cuts before and after cooking, one cut in each case cooked at high temperature and its mate at low temperature. The shrinkage, in weight and percentage, and the cooking time for each cut are given and the amount of drippings is shown.

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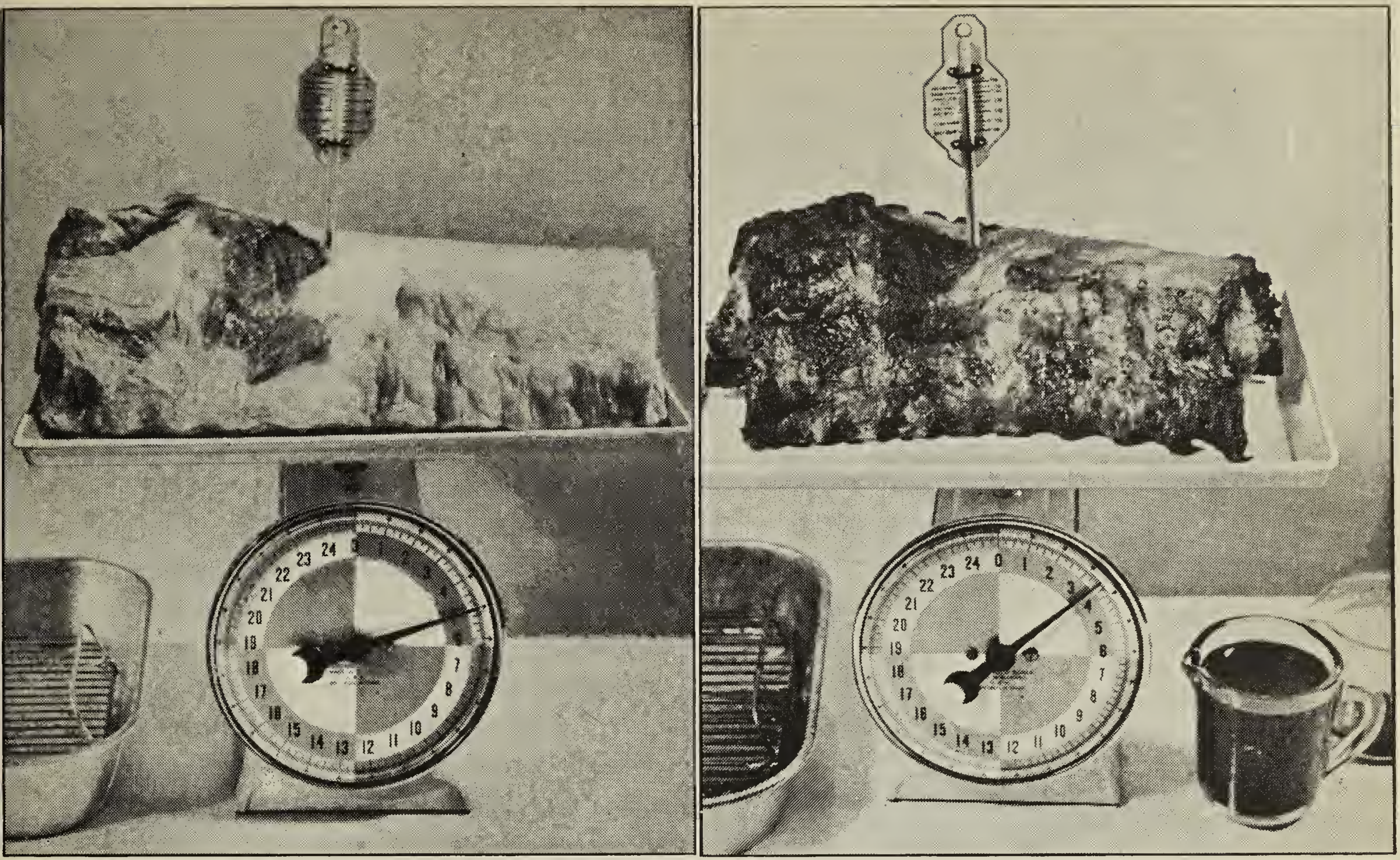
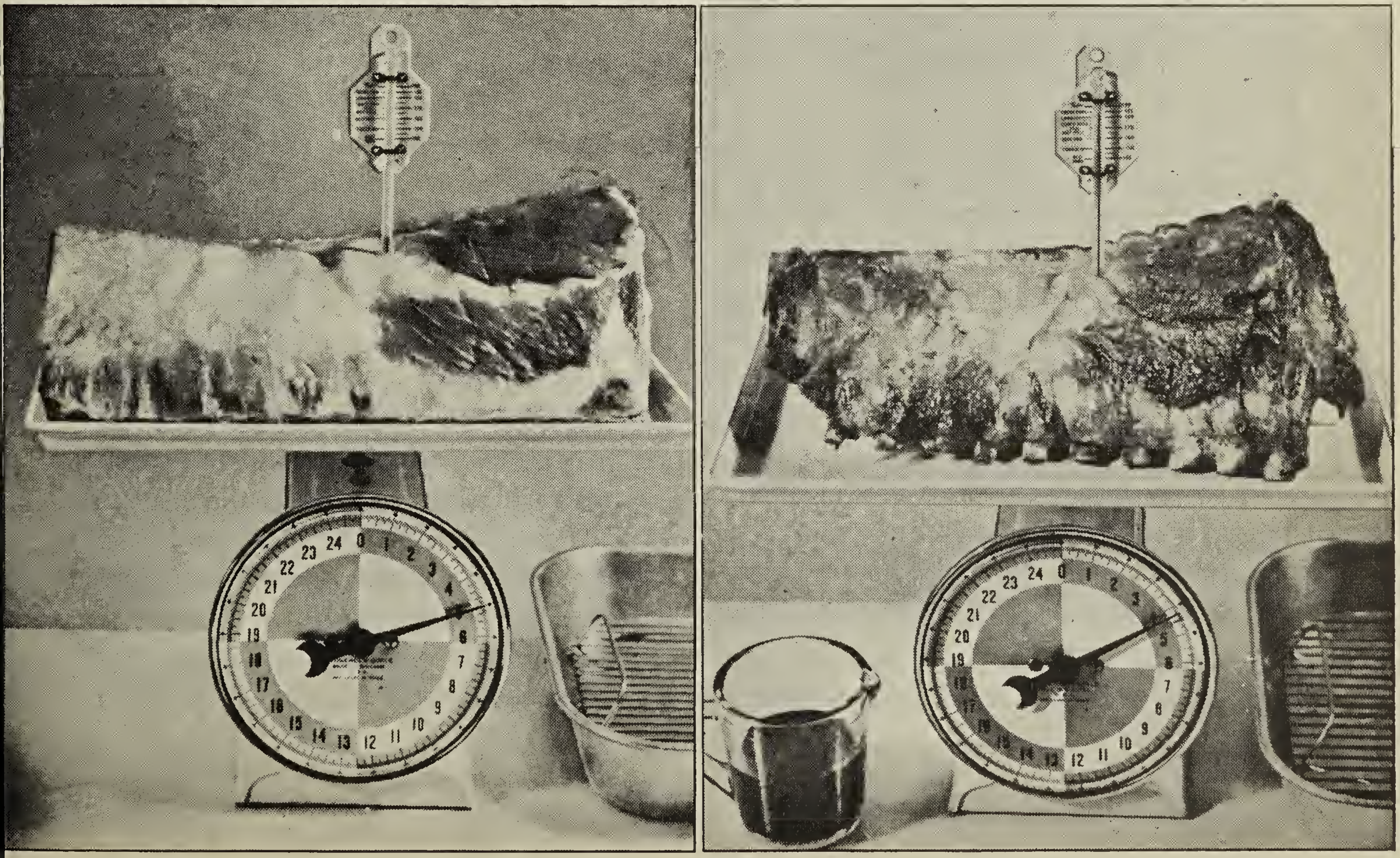
[1] Identical cuts from the right and left sides of the same carcass.



National Live Stock and Meat Board

These Pictures Show the Shrinkage and Dripping Loss of Two Comparable Pork Loins, One Cooked at 500° F. and the Other at 350° F · Both were cooked to an internal temperature of 185° F. The first required 1 hour and 15 minutes and the second 2 hours and 20 minutes

National Live Stock and Meat Board



Tables XXXV and XXXVI show the effect of roasting temperature on shrinkage of hams and lamb legs. The figures given in these tables are averages of a large number of roasts.

TABLE XXXV · *Effect of Roasting Temperature on Shrinkage of Commercially Cured Hams*[1]

OVEN TEMPERATURE	AVERAGE WEIGHT OF HAMS		INTERNAL TEMPERATURE OF HAMS (DONENESS)	SHRINKAGE DURING COOKING	
	Before Cooking	After Cooking			
	Pounds	*Pounds*		*Pounds*	*Per cent*
250° F. .	14	12	158° F.	2	15
300° F. .	14	11	158° F.	3	21
375° F. .	14	10	158° F.	4	28

TABLE XXXVI · *Effect of Roasting Temperature on Shrinkage of Lamb Legs*[2]

OVEN TEMPERATURE	AVERAGE WEIGHT OF THREE LAMB LEGS (IN ONE PAN)		TEMPERATURE OF LAMB LEGS WHEN DONE	SHRINKAGE DURING COOKING	
	Before Cooking	After Cooking			
	Pounds	*Pounds*		*Pounds*	*Per cent*
250° F. .	16⅓	12	180° F.	4⅓	26
300° F. .	16	11	180° F.	5	31
350° F. .	15¼	10¼	180° F.	5	33
Seared at 500° F. Finished at 300° F.	16	10¾	180° F.	5¼	33

When meat is cooked slowly, it is more tender, juicier, and more flavorful. High temperatures toughen protein and cause excessive evaporation with loss in flavor and juiciness. Searing does not hold in meat juices. (See Table XXXVI.)

Meat cooked at low temperature is more uniformly cooked than that cooked at high temperature. The protein is more tender and easily digested. There is less loss of fat and there is better retention of the important B vitamins. Less fuel is required to cook meat slowly, even though the cooking time is longer. This is particularly true of roasting.

Furthermore, low cooking temperatures mean easier and more economical carving. Not only is meat cooked at low temperature more tender than that cooked at high, but the muscle fibers hold together better and there is less crumbling and falling apart. High temperatures harden the outside of the meat and make it difficult to slice.

Stage of Doneness. The internal temperature to which meat is cooked also influences its shrinkage. At the same oven temperature the loss in weight will increase with the internal temperature to which the roast is cooked. Pork must be cooked well done, but pork roasts become dry and shrink unduly when overcooked. When cooked to exactly the correct degree, pork roasts are juicier and more flavorful, and there is more meat to serve. The temperature, as shown by a thermometer inserted in the meat, is the most accurate measure of its stage of doneness.

Cooking Time. The time of cooking any particular piece of meat depends upon several factors: (*a*) *The cooking temperature.* In general, the higher the cooking temperature the shorter the total cooking time and also the time per pound. (*b*) *The interior temperature* or *stage to which the meat is cooked.* It requires a longer time to cook meat well done than to cook it rare. (*c*) *The distance from the surface to the center of the thickest portion of the meat.* The longer the distance that the heat must travel to reach the center of the thickest part of the meat, the greater the total time required for cooking, although the time per pound may be less. A thin piece of meat, long and wide, requires a shorter cooking time than a compact one of the same weight. A rolled rib roast requires a longer cooking time than the same roast cooked with the bone in, since rolling usually increases the diameter of the roast. (*d*) *The composition of the meat.* Fat tissue usually conducts heat more slowly than lean tissue, except that of very undernourished animals. Melted fat which has escaped from the cells transmits heat rapidly. (*e*) *The temperature of the meat at the beginning of the cooking period.* Cooking may be begun when the meat is frozen, when it is still chilled, or at room temperature. The lower the initial temperature of the meat, the longer the cooking time required.

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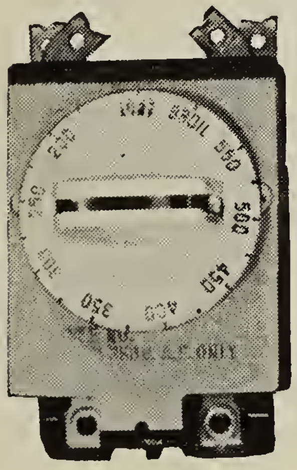
[1] Study made at the University of Missouri, 1939.

[2] Study made at the University of Texas, 1942.

Tables giving time per pound are made up of averages and may not cover a certain condition. The actual cooking time may be longer or shorter than these averages for many and varied reasons.

Determining Doneness. Cooking time is a practical guide for certain tender cuts of definite thickness, such as chops, steaks, and ham slices. Inserting a fork is a practical test for determining the doneness of less tender cuts. A highly skilled meat cook is able to tell the approximate doneness of roasts by their "feel," their resistance to pressure. The meat thermometer, however, is the only accurate guide to the doneness of roasts. Cooking time cannot be depended upon.

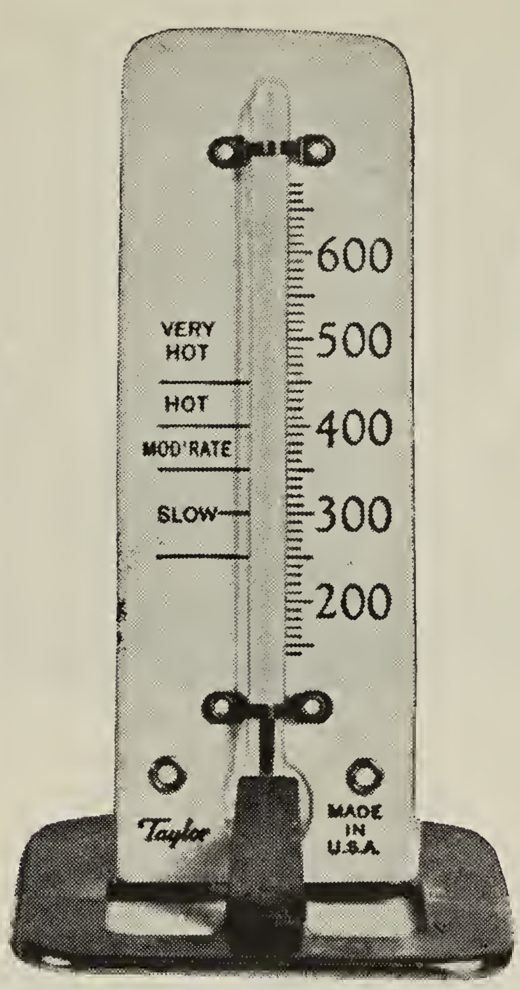


Automatic Regulators Control Oven Temperatures

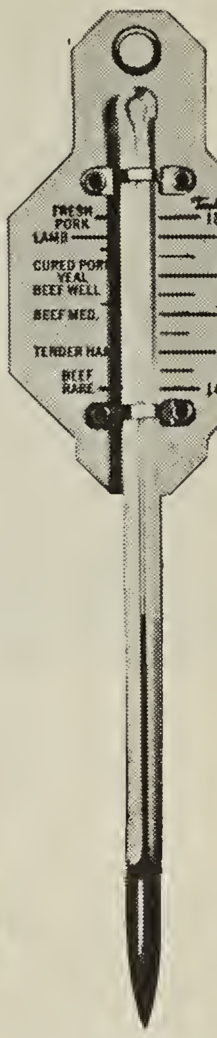
Westinghouse

Regulators and Thermometers. Modern automatic oven regulators make it possible to maintain easily the low temperatures desirable for cooking meat in the oven, while the meat thermometer shows the stage of doneness of the meat.

The meat thermometer and the oven regulator go hand in hand to produce uniform, desirable results in cooking all kinds of roasts. Also in broiling, a meat thermometer may be used to determine the doneness of thick steaks and chops. When ovens are not automatically controlled, an oven thermometer should be used for determining the temperature. Also, oven regulators should be checked occasionally with an accurate oven thermometer.



Taylor Instrument Companies



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Oven Thermometer · (*Left*) When there is no automatic regulator, an oven thermometer may be used to regulate the temperature by hand, and is useful in checking the accuracy of the automatic regulators. **Meat Thermometer** · (*Right*) When inserted in the center of the meat, this device registers its temperature and indicates the stage of doneness

METHODS OF COOKING MEAT

Both dry- and moist-heat methods are used in cooking meat. Only tender cuts may be cooked by dry heat, since added water or steam is required to soften or make tender the connective tissue in the less tender cuts.

National Live Stock and Meat Board

Roast Ready for the Oven · Add no water; use no cover

Tender cuts, or those low in connective tissue, are best when cooked by dry heat. These include roasts, steaks, and chops from the ribs and loins of all carcasses except Utility Grade, and from certain parts of the chuck and round in choice and good grades.

Methods of cooking by dry heat are roasting, broiling, pan-broiling or griddle-broiling, and frying. With these methods, the heat is applied so as to bring about the desired color changes, with the minimum loss of fat, meat juices, vitamins, and the maximum development and retention of flavor and nutrients. Since tenderness is an important factor in determining the price of a given cut, it is uneconomic to cook tender cuts by moist-heat methods.

Less tender cuts, or those high in connective tissue, must be cooked by moist heat in order to make them tender. Such cuts generally include neck, shoulder, shanks, bottom round, rump, flank, brisket, and may include most cuts of Utility Grade carcasses. Methods of cooking by moist heat are braising—the method of cooking a pot roast or Swiss steak—and stewing or cooking in liquid. With these methods, moist heat is applied so as to soften the connective tissue and make the meat tender.

There are a few exceptions to the general rule of dry heat for tender meat and moist heat for less tender. Thin cuts of pork and veal may be better when braised than when broiled or pan-broiled. Braising cooks pork and veal chops, steaks and cutlets, well done without drying them out. It is best, too, to braise pork liver, although veal liver may be broiled. These meat cuts also may be fried successfully.

Standard Cookery Methods. There are six standard methods for cooking meat. These are roasting, broiling, pan-broiling or griddle-broiling, frying, braising, stewing or cooking in water.

The cookery method selected for meat depends mainly upon the tenderness of the cut, but also upon its size and thickness, personal preference, and the cooking facilities available.

Step-by-step procedures for the standard methods for cooking meat follow.[1]

HOW TO ROAST. Any tender cut of beef, veal, pork, or lamb may be roasted. The steps in this method of cooking are as follows:

1. *Season with salt and pepper, if desired.* It matters little whether a roast is salted before or during cooking, because when it is done, the salt has penetrated only to a depth of about half an inch.

2. *Place on rack in an open shallow roasting pan, with fat side up.* The rack holds the roast out of the drippings; with the fat on top, the roast will do its own basting.

3. *Insert a meat thermometer so that its bulb is in the center of the largest muscle.* The thermometer should not touch bone or fat.

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[1] These and the accompanying tables are used by courtesy of the National Live Stock and Meat Board.

4. *Add no water and do not cover.* Roasting is a dry-heat method of cooking, and if the pan is covered or water added, the method becomes a pot roast.

5. *Roast in a slow oven,—250° to 350° F.* 300° F. is the best all-round temperature, but the temperature varies with the size of roast and kind of meat. The oven may be started just as the roast is put in, or it may be preheated.

6. *Roast to the desired stage of doneness.* There will be no overcooking or undercooking if a meat thermometer is used for determining when the roast is done.

How to Broil. Tender beef steaks, lamb or mutton chops, sliced ham or bacon, and ground beef or lamb are suitable for broiling. Fresh pork and veal are seldom broiled. Steaks and chops should be cut at least an inch thick for best broiling and a slice of ham at least half an inch. These steps show how to broil:

1. *Turn the oven regulator to "broil"* (350° F.). The broiler may be preheated or not, as desired. With some broilers thick steaks or chops may be cooked without preheating the broiler.

2. *Place meat on rack of broiler pan adjusted so that the top of the meat is two to three inches from the heat.* Steaks or chops one and a half to two inches thick should be at least three inches from the heat; those one inch or less in thickness, about two inches.

3. *Broil until top side is brown.* The meat should be approximately half done by the time it is browned on top.

4. *Season the top side with salt and pepper.* For a slice of ham or bacon this step would be omitted. Steaks and chops brown better if browned before salting.

5. *Turn and brown the other side.* For determining accurately when a thick steak is done, a meat thermometer may be used; for thick chops or patties, insert the thermometer in one of them.

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Oven Broiling · Steak is placed on the rack of the broiler pan, which has been adjusted so that the top of the meat will be 2 to 3 inches from the heat

6. *Season and serve at once on a hot platter.*

How to Pan-Broil. The same tender cuts suitable for broiling may be pan-broiled or griddle-broiled. When cuts are very thin, pan-broiling or griddle-broiling may even be preferred. Pan-broiling is a convenient method for a small steak or a few chops. Follow these steps, whether pan-broiling or griddle-broiling:

1. *Place meat in heavy pan or on a griddle. Cook slowly.* The pan or griddle does not need to be preheated. The meat merely begins cooking more quickly if it is warm or hot at the beginning.

2. *Do not add fat or water. Do not cover.* Pan-broiling or griddle-broiling is a dry-heat

Pan-Broiling · Use heavy pan, turn to cook evenly, and pour off any fat that accumulates

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method of cooking; if a cover is used or liquid is added, the meat is braised. Most meat cuts have enough fat to prevent sticking; if fat is added they will be fried.

3. *Turn occasionally.* Since the meat is in contact with the hot metal of the pan on only one side, turning more than once is essential for even cooking.

4. *Pour off or remove fat as it accumulates.* If fat is permitted to collect, the meat will fry instead of pan-broil or griddle-broil.

5. *Brown meat on both sides.* Meat does not need to be seared or browned quickly at the beginning; a gradual browning is better.

6. *Do not overcook. Season and serve at once.* Fairly accurate cooking times have been determined for this method. A meat thermometer, however, is essential in experimental work; and it will show the inexperienced cook accurately when thick steaks and chops are done.

How to Fry. Comparatively thin pieces of tender meat, or that made tender by pounding, scoring, cubing, or grinding, and left-over meat may be fried. When a small amount of fat is added or allowed to accumulate during cooking, the method is called frying, pan-frying, or sautéing. When the meat is immersed in fat, the method is called deep-fat frying.

Pan-Frying · Use enough fat to prevent sticking. Preheat the fat before the meat is added. Always keep below smoking temperature

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How to Pan-Fry: 1. *Use a heavy frying pan.* The fat will heat more evenly and the meat cook more uniformly in a heavy pan than in a light one.

2. *Heat a small amount of fat in the pan or allow the fat from the meat to accumulate.* Any meat that has a coating of flour, meal, or egg and crumbs and meats that are very low in fat, such as liver or cubed steak, will need fat added. On the other hand, it will not be necessary to add fat for a slice of ham or for a pork chop unless the chop is breaded.

3. *Keep fat below the smoking point.* When fat smokes, it is burning or breaking down. Such a temperature is too high not only for the fat, but also for the meat. A thermometer is helpful in determining the temperature of the fat in deep-fat frying.

4. *Do not cover the meat.* Frying is another dry-heat method of cooking. If covered, the meat is braised, and its crispness, which is one object in frying, is lost. It is true that the meat will be less tender than if a cover is used; but in frying there is some sacrifice of tenderness in order to obtain crispness and a desired flavor.

5. *Cook at moderate temperature and turn occasionally.* Turning is necessary in pan-frying, as it is in pan-broiling, to insure even cooking.

6. *Cook until browned on both sides and the meat is done.* The difficulty in frying is to cook the meat through while it is browning. Time may be used as a guide to the degree of doneness; also, for practical purposes, a gash may be cut close to the bone—if there is bone—to observe the color of the meat and juice.

How to Fry in Deep Fat: 1. *Use a deep kettle and a frying basket.* There should be enough fat to cover the meat completely; a wire basket is needed to lower the meat into the fat and to remove it from the fat when done.

2. *Heat fat to frying temperature.* Suitable temperatures for deep-fat frying of meat range from 300° to 350° F., depending upon the size of the pieces and whether the meat is uncooked or left over. A frying thermometer is desirable.

3. *Using the frying basket, lower a few uniform pieces of meat at a time, gradually, into the hot fat.* Before being placed in the basket, the meat may be coated with egg and crumbs or a batter, or dredged with flour or corn meal. This increases the browning and adds to the crispness and flavor.

4. *Brown meat and cook it through.* When the meat is covered with fat, no turning is necessary and both sides are cooked at once. The cooking time, therefore, is less than in pan-frying.

5. *When done, drain fat from meat into kettle before removing meat from basket.* This is another use of the basket.

6. *Strain fat through cloth and cool. Cover and store in refrigerator.* The life of fat used for frying will be much longer if crumbs and other food particles are removed. The fat should be strained after each use.

How to Braise. Braising is a method for cooking the less tender meat cuts. Some tender cuts also are good braised. These include the following: pork chops, steaks, and cutlets; veal chops, steaks, and cutlets; and pork liver. The following steps show how to braise, whether a large pot roast or a thin cut is being cooked:

1. *Brown meat slowly on all sides in heavy utensil.* The browning develops flavor and color. To intensify the browning, the meat may be dredged with flour; then it is necessary to add fat to the pan. A slow browning is better than a quick browning at high temperature.

2. *Season with salt, pepper, herbs, spices, and vegetables.* In moist-heat cookery, the seasoning penetrates the meat to a greater extent than in roasting. The less demanded cuts and lower grades of meat are the ones adapted to this method of cooking, and seasoning is important with these cuts.

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Braising Steaks or Chops · Add a small amount of liquid after browning, cover, and let steam until tender

3. *Add a small amount of liquid to the less tender cuts.* The liquid may be water, soup stock, vegetable juice, sour cream, or marinade. Added liquid is not essential in braising tender cuts.

4. *Cover closely.* A tight-fitting lid holds in the steam needed for softening the connective tissue and making the meat tender.

5. *Cook at low temperature until tender.* This means simmering, not boiling. It may be done on top of the range or in a slow oven, not above 300° F.

6. *Make sauce or gravy from the liquid in the pan.* The gravy is an essential part of any braised meat dish. It contains meat flavors and soluble food nutrients, and should accompany the meat.

How to Simmer. In simmering, meat cuts are cooked immersed in water or other liquid held below the boiling point. This method is used in cooking large pieces for use sliced, in making stews from small chunks of meat, and in extracting the flavor and gelatin from cuts containing much connective tissue and bone in the preparation of meat soups.

Pot-Roasting · (*Upper left*) Brown in beef fat to develop rich flavor. (*Upper right*) Place on rack in kettle and add a small amount of water. Cover closely and cook at low temperature until tender. (*Lower left*) Vegetables may be added during the last hour of cooking. Adjust the time so they will be steamed just tender

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All these methods are suitable for the less demanded, cheaper cuts that are high in flavor and nutritive value but need to be cooked for tenderness. In making soups the bony portions, especially the joints, are desirable. Veal has less flavor than beef, but may be used to advantage with beef since it is high in connective tissue and low in fat.

LARGE CUTS: 1. *Brown meat on all sides*, except corned beef and cured pork. The browning develops flavor and increases color.

2. *Cover the meat with water or stock.* The liquid may be hot or cold. If the meat is entirely covered with liquid, uniform cooking is assured. The main difference between braising and simmering is the amount of liquid used.

3. *Season well with salt, pepper, herbs, spices, and vegetables, as desired.* Wisely used, seasonings add much to the flavor of meats which are simmered. Some suggestions are bay leaves, thyme, marjoram, parsley, green pepper, celery and onion tops, tomatoes, garlic, cloves, peppercorn, and allspice, chili sauce, and ketchup.

4. *Cover kettle and simmer until tender.* Overcooking and boiling shrink the meat and make it dry, flavorless, stringy, and difficult to slice.

5. *If the meat is to be served cold, let it cool, and then chill in the stock in which it was cooked.* The meat is more flavorful and juicy and it will shrink less if cooled in its stock.

6. *If vegetables are to be cooked with the meat, as in boiled dinners, add them whole or in large pieces, just long enough before the meat is tender to cook them.*

STEW: 1. *Cut meat into uniform pieces, one- to two-inch cubes*, rectangular pieces, or long narrow strips.

2. *If a brown stew is desired, brown meat cubes on all sides.* Dredging them with flour intensifies the browning. If meat is floured,

fat must be used. If a light stew is preferred, browning is omitted.

3. *Add just enough water, vegetable juices, or soup stock to cover the meat.* The liquid may be added hot or cold; however, if it is hot, the meat begins cooking at once.

4. *Season with salt, pepper, herbs, and spices.* Stews are much better when plenty of attention is given to seasonings. (See step 3 under simmering large cuts, above.)

5. *Cover kettle closely and simmer until meat is tender. Do not boil.* It will require from one to three hours to cook the stew, depending upon the kind, quality, and cut of meat. If cooking in a pressure sauce pan, follow the time suggested by the manufacturer.

6. *Add vegetables to the meat at the proper time so as not to overcook them.* The vegetables may be left whole, quartered, or cut in small uniform pieces. Carrots, onions, potatoes, and peas are standard, though no better than many other combinations which have variety in color, texture, and flavor.

7. *When done, remove meat and vegetables to a pan, platter, or casserole and keep hot.* The peas or other bright-green vegetables may be cooked separately for garnishing the stew.

8. *Thicken the stock with flour made into a paste, using a small amount of cold water or stock.* Use 2 tablespoons flour for each cup of stock in the pot. Bring to a hard boil.

9. *Pour hot gravy over the meat and vegetables or serve separately.* The gravy is an essential part of a stew, but it does not necessarily have to be over the meat and vegetables when served.

10. *If desired, make meat pie from the stew.* A meat pie is merely a stew with a top on it. The top may be made of pastry, shortcake, biscuits, mashed potatoes, or cereal.

Soup: 1. *Use any kettle suitable for cooking meat in liquid.* The stockpots in the kitchens of institutions usually have a spigot near the bottom for drawing off the stock from the bones, meat, and vegetables, and most of the fat.

2. *Cut meat from bones and saw bones into three- or four-inch lengths.* If meat is to be browned, this makes more surface for browning. Having meat and bones in small pieces exposes greater surface to the cooking liquid, and less water is required to cover them.

3. *Cover with hot or cold water. Add salt.* Covering with liquid permits more extractives and food nutrients to be dissolved out. Salt helps to draw out these constituents and flavors the soup.

4. *Simmer for several hours (185° to 208° F.).* If the meat is to be served with the soup, three to four hours not only will make it tender but also will complete the extraction of flavor and usually will bring about the formation of gelatin from collagen in the meat. Bones may cook six hours or longer.

5. *Add chopped vegetables and seasonings.* These should be added after the meat begins to become tender, since overcooking them may result in undesirable flavors and color.

6. *Use the stock, meat, and vegetables for soup.* For vegetable soup, meat is usually not included, only the meat stock and a variety of vegetables.

If meat is not used in soup, make it into hash, creamed dishes, or croquettes that may have flavor added.

Simmering · Use a heavy kettle with rack and close-fitting lid for simmering. It may be iron or heavy aluminum

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7. *Clarify the stock for any of the clear soups.* Special stocks are prepared for the various clear soups. Directions for these and for clarifying soup stock are given below:

Brown stock. Brown stock is made from beef or other meat. All the meat is cut off the bone and well browned. The browning develops both flavor and color. Let the meat stand in cold salted water before simmering, to help dissolve off the browned part.

White stock. White stock is usually made from veal or chicken. The procedure is the same as for brown stock except that the meat is not browned and vegetables and seasonings which give a delicate flavor are used.

Lamb or mutton stock. Both meat and bone are used but the fat is discarded. At least part of the meat may be browned. This stock is usually called broth and is the basis of the Scotch broths. The meat, cut in cubes, is served in the broth together with barley and vegetables. Scotch broth is quite thick.

Bouillon. Bouillon is a clear beef soup made from brown soup stock, freed of fat, seasoned with herbs and spices, and clarified.

Consommé. Consommé is another clear soup. The stock is made from a combination of two or more kinds of meat, such as beef, veal, and fowl. It is highly seasoned, strained, and clarified.

Jellied soup. A jellied soup made from meat containing large amounts of bone and connective tissue will form a gel when it cools. By adding gelatin to make a one per cent solution, jellied bouillon or consommé may be made from stock which will not solidify by itself.

Clarifying soup stock. To make any of the clear soups mentioned above, or their variations, the stock must be clarified. It should be strained through several thicknesses of cheesecloth and then chilled as rapidly as possible to prevent spoilage. After the stock is cold and before it is used, the fat which has solidified into a cake on top can be removed easily. This fat may be used for frying or for seasoning vegetables.

The soup should be dipped from the top, so the sediment in the bottom of the kettle will not be disturbed. This is coagulated protein and can be used in other soups or in gravies.

If a sparkling soup is desired, the stock is clarified still more, according to the following procedure:

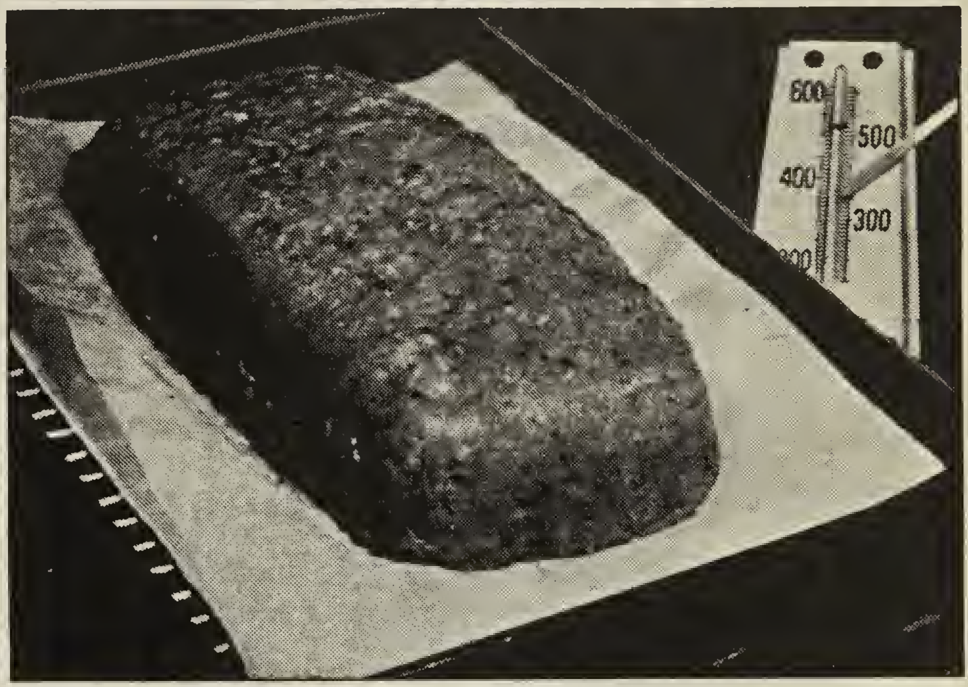
Remove the cake of fat from the stock and wipe the top with a warm damp cloth to take off any remaining bits of fat. Add to each quart of cold stock the white of one egg, beaten slightly and mixed with the crumpled shell. The stock then should be heated very slowly to the boiling point, with constant stirring. As the egg coagulates, it collects the fine particles which were not removed by straining through cheesecloth.

As soon as the boiling point is reached, the stirring should be discontinued and the soup allowed to boil for five minutes. Then strain again through several thicknesses of warm damp cheesecloth. This should result in a clear, sparkling soup such as is served as an appetizer at dinner. If the soup is to be kept hot for some time before serving it should be placed over hot water, rather than over the direct flame, to prevent cloudiness.

Cooking Frozen Cuts. Thin steaks, chops, cutlets, and ground meat patties may be started to cook while frozen. (See page 192.) Stew meat may be defrosted in the cooking water. Thick steaks, roasts, and pot roasts cook more uniformly if defrosted before cooking. Also, the same cooking temperatures and time schedules are used for defrosted cuts as for those which have not been frozen.

If roasts are started cooking while still hard-frozen, very low cooking temperatures (250° to 275° F.) should be used in order not to overcook the outside while the inside is still uncooked. Insert a meat thermometer into the meat as soon as it is thawed. Then leave the thermometer in the roast until it is done, just as with an unfrozen roast. The cooking time will be longer.

Gravies and Sauces. Gravy or a meat sauce is an essential part of any braised meat dish or stew. The drippings or broth contain much of the meat flavor and soluble food nutrients. By making gravy and serving it



Ways for Chopped Meat · (*Upper left*) Hamburgers may be plain, wrapped in bacon, or broiled on onion slices. (*Upper right*) Seasoned ground meat is broiled on toast or rolls, served plain or with barbecue sauce. (*Lower right*) a well-made beef loaf is a company dish, sliced hot or cold

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with the meat, one conserves both flavor and nutrients, and may add other seasonings.

Gravy or sauce may accompany meat cooked by any of the other methods. While it is not so essential as with braised or stewed meat, it does extend the meat flavor, since even with dry-heat cooking there are some drippings.

If there is excess fat in the drippings, it should be drained off, strained, and stored for future use. For gravy approximately 2 tablespoons of fat and 2 of flour are used for each cup of liquid.

It is usually best to make gravy after the meat is removed, in the pan in which the meat was cooked, in order to utilize all the brown particles in the bottom of the pan.

Blend the flour and fat drippings, stirring until the mixture becomes a rich brown, but avoid burning. Since the flour will not brown after the liquid is added, any browning must be done before. Frequently, the drippings are brown enough to give the gravy an attractive color without further browning after the flour is added.

The liquid used may be water, vegetable liquid, meat stock or milk, or a combination. Many people prefer pork gravy made with milk, and other meat gravies made with water or stock. It is more difficult to make good gravy with hot liquid than with cold, since the flour may cook before the gravy can be stirred smooth. After adding the liquid, stir constantly until the gravy reaches a hard boil. Season with salt, pepper, and any herbs or seasoning vegetables desired.

When there is liquid in the drippings, as is often the case with braised meats, and always with stews, the flour should be blended with a little cold liquid before being added to the meat juices. In all cases the flour must be thoroughly cooked by boiling. If the gravy is too thick, thin with additional liquid and adjust the seasonings.

Never hide an attractive serving of meat

TABLE XXXVII · *Timetable for Cooking Beef*[1]

CUT	ROASTED AT 300° F. OVEN TEMPERATURE		BROILED[2]		BRAISED	SIMMERED
	Meat Thermometer Reading	Time	Meat Thermometer Reading	Total Time	Total Time	Total Time
	Degrees F.	*Minutes per lb.*	*Degrees F.*	*Minutes*	*Hours*	*Hours*
Standing ribs	140 (*rare*)	18 to 20				
Standing ribs	160 (*medium*)	22 to 25				
Standing ribs	170 (*well done*)	27 to 30				
Rolled ribs	Same as above	Add 10 to total time				
Blade, 3rd to 5th rib (*high quality only*)	150–170	25 to 30				
Rump (*high quality only*)	150–170	25 to 30				
Tenderloin	140–170	20 to 25				
Beef loaf	160–170	25 to 30				
Steaks (*1 inch*)			140 (*rare*)	15 to 20		
			160 (*medium*)	20 to 30		
Steaks (*1½ inch*)			140 (*rare*)	25 to 35		
			160 (*medium*)	35 to 50		
Steaks (*2 inch*)			140 (*rare*)	30 to 40		
			160 (*medium*)	50 to 70		
Beef patties (*1 inch*)			140 (*rare*)	12 to 15		
			160 (*medium*)	18 to 20		
Pot roasts						
Arm or blade					3 to 4	
Rump					3 to 4	
Swiss steak					2 to 3	
Corned beef						3½ to 5
Fresh beef					3 to 4	3 to 4
Stew						2 to 3[3]

by covering it with gravy. The gravy may be served under the meat on the plate, or in a sauceboat. A small amount of an attractive sauce may be served over the meat, such as Swiss-steak sauce, mushroom, or tomato sauce.

Natural pan gravy, to accompany roasts or steaks, consists merely of pan drippings diluted and well seasoned. Use about half as much boiling water as pan drippings. Season with salt, pepper, Worcestershire sauce, and other seasonings desired.

BEEF AND WAYS TO COOK IT

Different grades and cuts of beef vary greatly in tenderness. It is necessary, therefore, to select beef cuts with the cooking methods in mind, or to adapt the cooking methods to the cuts selected.

Cooking Methods. All tender cuts of beef, including parts of the chuck and round, may be roasted or broiled. Some less tender cuts from the higher grades may be roasted if low temperatures are used. Many of these cuts also may be broiled or pan-broiled. Most cuts of utility-grade beef, on the other hand, are best if cooked by moist heat.

Tough portions may be ground and then cooked in the same ways as the tender cuts. Less tender steaks may be tenderized by pounding, scoring, or cubing.

Table XXXVII gives the approximate time or the cooking schedule necessary when the various cuts of beef are roasted, broiled, braised, and simmered.

VEAL AND WAYS TO COOK IT

Most veal cuts are very much like those of beef, except that they are from one-third to

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[1] For frying see discussion on page 200.

[2] Pan-broiling or griddle-broiling requires approximately three-fourths the time for broiling.

[3] If cooking in a pressure saucepan, follow the timetable of the manufacturer.

TABLE XXXVIII · *Timetable for Cooking Veal*[1]

CUT	ROASTED AT 300° F. OVEN TEMPERATURE		BROILED		BRAISED	SIMMERED
	Meat Thermometer Reading	Time	Meat Thermometer Reading	Total Time	Total Time	Total Time
	Degrees F.	*Minutes per lb.*	*Degrees F.*	*Minutes*	*Hours*	*Hours*
Leg	170	25				
Loin	170	30 to 35	Veal is seldom broiled			
Rack	170	30 to 35				
Shoulder						
Whole	170	25				
Rolled	170	40 to 45				
Cushion	170	30 to 35				
Breast						
Stuffed	170	40 to 45			1½ to 2	
Rolled	170	40 to 45			1½ to 2	
Loaf	170	25 to 30				
Birds					¾ to 1	
Chops					¾ to 1	
Steaks					¾ to 1	
Stew						2 to 2½[2]

one-half the size of comparable beef cuts. The cuts from the loin of veal are called loin chops rather than steaks, as they are in beef. The loin of veal is used also as a roast. The chops from the rib section are known as rib chops.

Veal has certain characteristics which make its cooking somewhat different from that of the other meats. It lacks fat and, while it is tender, it has considerable connective tissue, which means that it requires long, slow cooking. Veal is delicate in color, becoming even lighter when cooked.

Cooking Methods. Methods of cooking which intensify the color and make the flavor more pronounced are best for veal. The methods most used are roasting, frying, braising, and simmering. Veal chops, steaks, and cutlets are best if fried or braised. For broiling or pan-broiling, only loin chops from high-quality heavy veal should be used. Also, a lower cooking temperature than that ordinarily used for broiling beef and lamb is advisable. Veal should be cooked to the well-done stage in order to soften the connective tissue present. Rich sauces and gravies add flavor to veal.

The illustrations which follow show typical veal cuts.

Table XXXVIII gives the approximate cooking time when veal is roasted, braised, and simmered.

PORK AND WAYS TO COOK IT

Some cuts of pork are in demand as fresh pork, while others are in greatest demand as cured pork. Many pork cuts are sold both fresh and cured. The flavor of pork is due very largely to the fat.

Cooking Methods. All cuts of pork are tender; therefore all large or chunky cuts, both fresh and cured, may be cooked by roasting. Fresh pork is usually roasted at 350° F. and cured pork at 300° F. There is no reason why all pork should not be roasted at 300° F., except that most people like the fat a little more brown and crisp than it becomes at that temperature. The shrinkage is less, however, when it is roasted at 300° F.

Pork chops, cutlets, sliced fresh ham or shoulder, and sliced pork liver are best if cooked by braising, rather than by broiling,

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[1] For frying see discussion on page 200.

[2] If cooking in a pressure saucepan, follow the timetable of the manufacturer.

TABLE XXXIX · *Timetable for Cooking Pork*[1]

CUT	ROASTED AT 300°–350° F. OVEN TEMPERATURE[2]		BROILED		BRAISED	SIMMERED
	Meat Thermometer Reading	Time	Meat Thermometer Reading	Total Time	Total Time	Time
	Degrees F.	*Minutes per lb.*	*Degrees F.*	*Minutes*	*Hours*	*Minutes per lb.*
Fresh						
Loin			Fresh pork is never broiled			
Center	185	35 to 40				
Whole	185	15 to 20				
Ends	185	45 to 50				
Shoulder						
Rolled	185	40 to 45				
Cushion	185	35 to 40				
Boston butt	185	45 to 50				
Leg or ham	185	30 to 35				
Chops					$\frac{3}{4}$ to 1	
Steaks					$\frac{3}{4}$ to 1	
Spareribs		30 to 35			$1\frac{1}{2}$	30
Pork and ham loaf		30 to 35				
Smoked						
Ham						
Large	160 to 170	15 to 18				
Medium	160 to 170	18 to 22				18 to 20
Small	160 to 170	22 to 25				
Half	160 to 170	25 to 30				25
Ham loaf	160 to 170	30 to 35				
Ham slice						
(½ *inch*)			160 to 170	15 to 20		
(*1 inch*)			160 to 170	20 to 30		
Picnic	170	35				35 to 45
Shoulder butt	170	35				
Bacon				4 to 5		

pan-broiling, or griddle-broiling. Braising cooks them well done without drying them out. They also may be cooked by frying.

Sliced smoked ham and bacon may be broiled, pan-broiled, or griddle-broiled. Ham also may be pan-fried, and bacon may be pan-fried, deep-fat fried, or oven-cooked (on a rack in an open roasting pan, at about 325° F.). Pork always should be cooked well done to eliminate any possibility of its containing trachinae, the parasites which occur occasionally in uncooked pork. The thermal death point of trachinae is far below the well-done stage. Another reason for cooking pork well done is to render out more of the fat, which helps to make it more readily digested. In cooking pork well done, care should be taken not to overcook it, since overcooking increases the shrinkage and makes the pork dry and tasteless.

Table XXXIX gives the approximate time for cooking pork, both fresh and smoked, by roasting, broiling (fresh pork is not broiled), braising, and simmering.

LAMB AND MUTTON AND WAYS TO COOK THEM

The thin, parchment-like covering over the outside of the lamb or mutton carcass is known as the fell. It does not affect the

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[1] For frying see discussion on page 200.

[2] 350° F. oven temperature is recommended for fresh pork and 300° F. oven temperature for smoked pork.

TABLE XL · *Timetable for Cooking Lamb*

CUT	ROASTED AT 300° F. OVEN TEMPERATURE		BROILED		BRAISED	SIMMERED
	Meat Thermometer Reading	Time	Meat Thermometer Reading	Time	Total Time	Time
	Degrees F.	*Minutes per lb.*	*Degrees F.*	*Minutes*	*Hours*	*Hours*
Leg	170 to 175	25 to 30				
Shoulder						
Whole	170 to 175	25 to 30				
Rolled	170 to 175	35 to 40				
Cushion	170 to 175	25 to 30				
Breast						
Stuffed	170 to 175	25 to 30			1½ to 2	
Rolled	170 to 175	25 to 30			1½ to 2	
Lamb loaf	170 to 175	25 to 30				
Chops (1 inch)			170	12		
Chops (1½ inch)			170	18		
Chops (2 inch)			170	22		
Lamb patties (1 inch)				15 to 18		
Neck slices					1	
Shanks					1½	
Stew						1½ to 2[1]

flavor unless the meat has been aged for some time. Under normal conditions, the fell should not be removed from the leg, since this cut keeps its shape better, cooks in less time, and is juicier when the fell is left on. Chops, however, are more desirable when the fell is removed before cooking.

Cooking Methods. Cuts from high-quality lamb, with the exception of the neck and shanks, are tender; therefore roasting, broiling, pan-broiling, or griddle-broiling are the cooking methods most used.

The rib and loin cuts of top-grade mutton also make excellent chops for broiling and pan-broiling. The leg of mutton may be roasted, especially at low temperature.

The neck, shanks, and breasts of both lamb and mutton may be braised, cut up for stew, or cooked by simmering. Lamb breast is tender and may be rolled or stuffed, and roasted; otherwise it is too thin a piece for roasting. Mutton shoulder from choice grade may be roasted, but this method is questionable for any lower grade; braising is safer. Most cuts of utility lamb or mutton are best if cooked by braising or stewing.

The meat from any of these less tender cuts also may be ground for patties or loaf, then cooked by roasting, broiling, or pan-broiling (griddle-broiling).

Lamb and mutton are cooked medium or well done. If cooked so that the meat is still slightly pink on the inside, there will be less shrinkage and it will be very juicy.

Lamb and mutton should be served very hot or thoroughly cold, but never lukewarm. The melting point of lamb and mutton fat is high and at lukewarm temperature it is of an unpalatable, pasty consistency. If eaten at this temperature, it clings to the roof of the mouth and leaves an undesirable flavor. It is very palatable, however, when served thoroughly cold, since then the fat is solidified.

Table XL gives the approximate time required to cook lamb by roasting, broiling, braising, and stewing. For the same degrees of doneness, the time required to roast and broil mutton is approximately the same. The less tender mutton cuts cooked by braising and stewing will require somewhat longer time than lamb cooked by the same methods.

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[1] In cooking in pressure saucepan, follow timetable of manufacturer.

TABLE XLI · *Timetable for Cooking Variety Meats*[1]

KIND	BROILED	BRAISED[2]		SIMMERED	
	Total Time	Total Time		Total Time	
	Minutes	*Minutes*	*Hours*	*Hours*	*Minutes*
Liver: beef					
3- to 4-pound piece			2 to 2½		
Sliced		20 to 25			
Veal (*calf*)—sliced	8 to 10				
Pork					
Whole (*3* to *3½ pounds*)			1½ to 2		
Sliced		20 to 25			
Lamb—sliced	8 to 10				
Kidney					
Beef				1 to 1½	
Veal (*calf*)	10 to 12			¾ to 1	
Pork	10 to 12			¾ to 1	
Lamb	10 to 12			¾ to 1	
Heart					
Beef					
Whole			3 to 4	3 to 4	
Sliced			1½ to 2		
Veal (*calf*)					
Whole			2½ to 3	2½ to 3	
Pork			2½ to 3	2½ to 3	
Lamb			2½ to 3	2½ to 3	
Tongue					
Beef				3 to 4	
Veal (*calf*)				2 to 3	
Pork Lamb } usually sold ready-to-serve					
Tripe					
Beef	10 to 15[3]			1 to 1½	
Sweetbreads					
Beef	10 to 15[3]	20 to 25			15 to 20
Veal (*calf*)	10 to 15[3]	20 to 25			15 to 20
Lamb	10 to 15[3]	20 to 25			15 to 20
Brains					
Beef	10 to 15[3]	20 to 25			15 to 20
Veal (*calf*)	10 to 15[3]	20 to 25			15 to 20
Pork	10 to 15[3]	20 to 25			15 to 20
Lamb	10 to 15[3]	20 to 25			15 to 20

VARIETY MEATS AND HOW TO COOK THEM

Variety meats is the term used to designate the internal organs of meat animals which are used for food. They include liver, heart, kidney, tongue, tripe, sweetbreads, and brains. Oxtails and pork feet are grouped occasionally with variety meats. Liver, heart, kidney, and tongue are both colorful and flavorful, while brains, sweetbreads, and tripe are lacking in color and very delicate in flavor.

Sweetbreads are the thymus glands of young beef, veal, and lamb. They consist of two parts, and are referred to as a pair of sweetbreads. As the animal matures, the thymus glands disappear.

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[1] For frying see discussion on page 200.

[2] On top of range or in a 300° F. oven.

[3] Time required after precooking in water.

Tongue may be purchased fresh, pickled, corned, or smoked. Tripe, the muscular lining of the stomach, may be purchased fresh, pickled, or canned. Fresh tripe is partly cooked before it is sold. There are two kinds of tripe: honey-comb, which is the lining of the second stomach of the beef, is considered more desirable than the plain or smooth tripe of the first stomach.

Cooking Methods. Variety meats, like all meats, should be cooked according to their tenderness. Liver and kidney from young animals, and brains and sweetbreads, are tender and, therefore, may be broiled, panbroiled, griddle-broiled, or fried. Frying in a small amount of fat or in deep fat is a particularly good method for cooking these meats, since they lack fat.

Tongue, heart, tripe, oxtails (beef tails), pork feet, beef kidney, and beef liver are less tender and need long, slow cooking in moisture. Tongue is cooked in simmering water until it is tender and the skin can be removed. Heart is usually stuffed and braised, like a pot roast. Oxtails are braised or stewed. Pork feet are simmered in water, usually with spices and seasonings. Beef kidneys are most often stewed, and beef liver is usually sliced and braised. Pork liver, too, is at its best when braised, although it is tender.

Variety meats are usually cooked well done, with the possible exception of veal

Variety Meats Are High in Nutritive Value · Pictured here are tripe (the stomach), hearts, brains, calves' sweetbreads (thymus), liver, and beef kidneys

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liver, which may be served medium-done, if desired. All variety meats from pork are cooked well done, the same as pork cuts.

National Live Stock and Meat Board

Tongues Are Available Fresh, Cured, and Canned

The different variety meats are illustrated on the previous page.

Table XLI gives the approximate cooking time necessary for the different variety meats.

SAUSAGES AND LUNCHEON MEATS

Down through the ages, different countries have made their contributions to the manufacture of various kinds of sausages. The great variety available today is due to the fact that each nation has made sausages to suit its particular taste, according to the limitations of meat, climate, and seasonings. As trade lanes were opened with the Orient, new and different spices were brought into Europe and were used in making sausages.

Like cheese, the origin of many sausages is seen in their names: bologna, from the city in Italy by that name. Also, genoa, salami, milano, sorrento, berliner, frankfurter, and others have names associating them with European cities, especially of Italy and Germany, the great sausage countries.

Like cheese, practically every kind of sausage is made now in the United States. Sausage manufacture is an important part of

TABLE XLII · *Kinds of Sausages and Their Preparation*[1]

Type	Characteristics	Examples	Preparation
I. Fresh pork sausages	Made of selected fresh pork cuts chopped fine and seasoned with salt and pepper and usually sage	Links of different sizes; bulk pork sausage; patties	Must be thoroughly done. Place in cold pan with a little water, cover, and cook slowly. Remove cover and brown
II. Smoked sausages	Made of selected cuts of beef or pork, or both, chopped fine and mixed with spices. Stuffed into casings. Cooked and then subjected to hardwood smoke	Frankfurters; bologna; cooked thuringer; mettwurst	Require reheating only. Usually in water at a simmering temperature. Frankfurters may be broiled. Bologna often eaten without heating
III. Dry or summer sausages available all year	Made of pork and beef, chopped, seasoned, cured, stuffed into casings. Some are then smoked and dried; other varieties are dried without smoking. Two divisions of dry sausage: salamis and cervelats. There are both hard and soft cervelats and salamis. Will keep indefinitely in a cool place	Genoa salami; Gothaer cervelat; Goettinger cervelat; pepperoni; thuringer cervelat; mortedella; landgaeger	Are ready to serve; sliced for sandwiches; added to omelets; added to scrambled eggs; garnish; appetizers
IV. Cooked specialties . . .	Prepared meat products. Cooked. Seasoned in variety of ways. Made from beef, pork, veal, tongue, and liver	Minced ham; deviled ham; veal loaf; liver loaf; braunschweiger; liver sausage; meat loaf	Ready to serve

[1] *Ten Lessons on Meat*, National Live Stock and Meat Board.

the meat-packing industry. In modern sausage-making there are four kinds of sausages: (1) fresh pork sausages, in bulk, patties, and links; (2) smoked sausages, such as frankfurters, bologna, and cooked thuringer; (3) dry or summer sausages, such as salami, cervelat, pepperoni; and (4) cooked specialties, some in sausage form (liverwurst). These are grouped with the so-called luncheon meats, such as minced and pressed ham, and various kinds of meat loaves.

Cooking Methods. All these meats are precooked except the first group and are called ready-to-serve or ready-to-eat meats. Many of them are served cold; some of them are usually reheated. Table XLII gives the kinds or types of sausages, with their characteristics and methods of preparation.

Links or patties of fresh pork sausage must be thoroughly cooked, like all pork. Both links and patties may be fried, broiled, panbroiled, griddle-broiled, or braised. Braising, or braising in reverse, is usually the most satisfactory method of cooking pork sausage. Links, particularly, are more attractive if browned at the end of the braising process rather than at the beginning. When fried or broiled, care must be taken to cook them very slowly so as not to dry them out while cooking them through.

Because of variation in the size of patties and links, it is difficult to state definite cooking times, but they must be cooked until there is no trace of pink inside.

CARVING MEAT CUTS

Depending upon the style of service, carving is done either at the table or in the kitchen. Regardless of where it is done or who does it, careful carving means added attractiveness and economy in the meat dish.

Necessity of Good Tools. Even the most expert carver needs the proper tools. Carving sets, consisting of a knife, a fork, and a steel, are made in different sizes and shapes with various kinds of handles. The style is a matter of preference and pocketbook. The knife blade, however, should be of the best quality steel so that it will take and hold a sharp edge.

Carving sets come in eight- and nine-inch knife blades; a steak set usually has a six- or seven-inch blade. Also for carving large roasts, there are long-bladed roast-beef slicers. For home use a large carving set for roasts and poultry and a steak set are quite sufficient.

To get the best results from any kind of carving knife it should have the best of care. Carving knives should be sharpened as often as needed and, by all means, should be kept separate from other cutlery, and washed by themselves. Knives should be steeled before using.

Steeling the Knife. There is a technique to handling the steel. It should be held firmly in the left hand, thumb on top of the handle, with the point held upward and slightly away from the body. With the knife in the right hand, place the heel of the blade (where the blade enters the handle) against the top of the steel on the side away from the body. With a swinging motion of the wrist and forearm the blade is brought down and across the steel toward the left hand, continuing until the point of the blade has passed over the steel. Then the knife is again brought into position, this time on the side of the steel next to the body, and with the same motion drawn up across the steel. This brings both sides of the knife blade in contact with the steel. The edge of the knife should make about a 25-degree angle with the steel. Five or six strokes on each side should be sufficient.

Importance of Cooking. With the proper tools, the next thing for successful carving is proper cooking of the meat. Both underdone and overdone meat are difficult to carve. Meat cooked at low temperature is more easily and economically carved than that cooked at high.

Skewers and strings should be removed from roasts in the kitchen. When carving is done at the table, the meat should be placed on a hot platter sufficiently large for easy carving, with an extra hot plate for placing the carved slices, if needed. Overgarnishing the meat platter should be avoided, if carving is to be easy.

When carving is done in the kitchen, the meat should be carved on a cutting board placed in a shallow pan to catch the drippings.

Principles of Carving. A sharp knife and properly cooked meat make a good beginning of the job of carving. In addition, the carver must know the meat to be carved—the location of the bones and joints and the directions in which the muscle fibers run. This knowledge can be acquired by studying the meat both before and after cooking, with the help of some good directions on carving.

Even when carving at the table the carver may either sit or stand. Convention does not forbid standing when it is easier to carve that way.

Across the Grain. When meat is boneless, the carving is very simple. The principal rule to follow is to cut across the grain of the meat whenever possible. This shortens the muscle fibers and makes the meat seem more tender. With most roasts and pot roasts, carving across the grain is accomplished by slicing parallel to the cut surface, since the market man cuts across the grain in preparing the cut. Steaks, however, are carved with the grain, unless they are very thick.

Carving Rolled Roast

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Parallel Slices. After the first slice is made, the angle at which the knife is held should not be changed. Each stroke with the knife should be drawn the full length of the blade, making parallel cuts.

Good carving, then, means (1) knowing where to make the first cut, and (2) continuing to make parallel cuts until enough portions are carved to serve everyone. The details of carving various cuts follow. The methods suggested are easy ways to obtain the greatest number of attractive uniform servings.

Any Rolled Roast. The roast is placed on the platter with the larger cut surface down. If carved in the kitchen on a cutting board, it may be placed in this same position; a long roast may rest lengthwise on the board, with the larger end toward the left.

Insert the fork firmly into the roast on the left side. Slice across the grain parallel to the cut surface, making uniform slices of an eighth to three-eighths of an inch thick. As each slice is carved, lift it to the side of the platter (or cutting board) or to a hot serving plate.

Standing Rib Roast. If the market man has separated the backbone from the ribs, the backbone can and should be removed in the kitchen after roasting. This will facilitate carving. The roast is placed on the platter (or cutting board) with the smaller cut surface up and the ribs to the carver's left.

The fork should be inserted between the two top ribs. From the outside edge of the roast, slice toward the ribs, making slices from one-eighth to three-eighths inch thick. Release each slice by cutting close along the rib with the tip of the knife.

After each slice is released, lift it on the blade of the knife to the edge of the platter or cutting board, or to a hot plate.

Porterhouse or T-Bone Steak. A steak need not be cut across the grain, since the muscle fibers are both tender and comparatively short. Place the steak on the platter with the backbone to the right and the flank end to the left. Holding the steak with the fork inserted at the left, cut close around the T-shaped bone and lift the bone to one side, out of the way of the carving.

With the fork in position, cut across the full width of the steak. Make wedge-shaped portions, widest at the far side. Each serving should consist of a piece of the tenderloin and a piece of the large muscle, the flank end being served last if additional servings are needed.

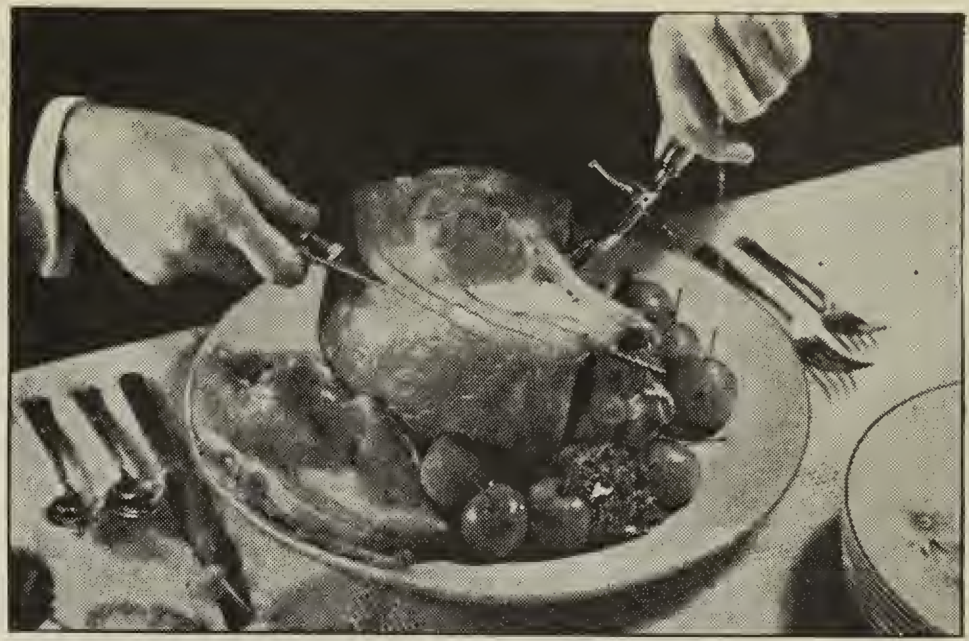
Other Steaks. Carving a sirloin steak is essentially the same as carving a porterhouse. A round steak is usually much thinner than a porterhouse or sirloin and, in carving, wider portions are cut. If the natural seams or divisions between the muscles are followed, carving will be easier. A Swiss steak is usually quite thick and the servings are cut narrower than with a thin round steak.

In the blade steak, the same bones are present that are in the blade pot roast. The bones are removed and the steak is cut in slices. See instructions on the blade pot roast.

Blade Pot Roast. This cut contains at least part of a rib and a portion of the blade bone. The bones may be slipped out before the pot roast is placed ready for carving.

Hold the pot roast with the fork inserted at the left and separate a section by running the knife between two muscles, then close to the bone (if the bone has not been removed).

Turn the section thus separated so that the grain of the meat is parallel with the platter. By holding the piece in this position with a fork, one can cut slices across the grain, one-fourth to three-eighths inch thick. The remaining sections of the pot roast are separated in the same way.



National Live Stock and Meat Board

Carving Standing Rib Roast

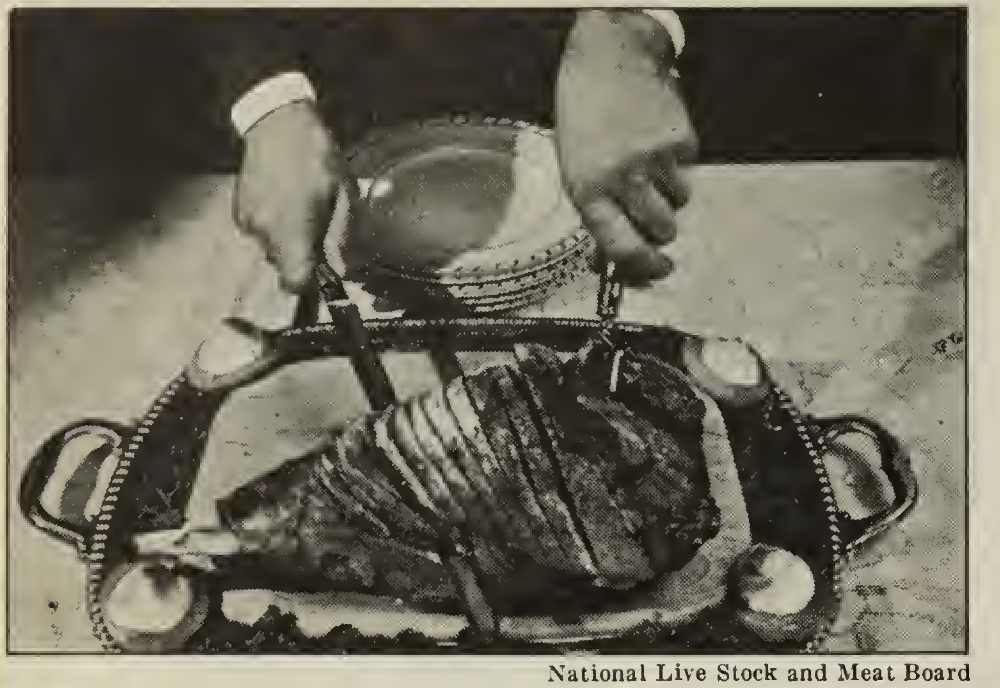
Pork Loin Roast. It is much easier to carve a pork loin roast if the backbone is separated from the ribs. This may be done if the butcher saws across the ribs close to the backbone. During roasting, the backbone becomes loosened and is easily removed by cutting between it and the rib ends before carving.

The roast is placed for carving so that the rib side faces the carver. This makes it easy to follow the rib bones as guides for slicing. Also, the attractive side of the roast is toward the guests, if the carving is being done at the table.

Insert the fork firmly in the top of the roast. Make sure of the slant of the ribs before beginning to slice, since the ribs are not all perpendicular to the platter. Cut close against both sides of each rib and alternately make one slice with a bone and one without. In a small loin, each slice may contain a rib. In a large loin it is possible to make two boneless slices between ribs.

Whole Ham Roast. A whole fresh or smoked ham may be carved the same way as a leg of lamb or mutton.

Leg-of-Lamb Roast. The roast leg should be placed before the carver so that the shank bone is to his right and the thick meat section, or cushion, on the far side. Roasts from



National Live Stock and Meat Board

Carving Leg of Lamb

the two sides of the carcass will not have the same surface uppermost. This, however, does not affect the method of carving.

Insert the fork into the large end of the leg and carve a few slices lengthwise from the near, thin slide. Turn the roast so that it rests on the surface just cut. The shank bone now points up from the platter.

With the fork in the left of the roast, begin at the shank end and slice down to the leg bone, making parallel slices of about one-fourth inch thick. Continue slicing until enough slices are made, or until the aitchbone is reached.

With the fork still in place, run the knife along the leg bone, releasing the slices.

Other Cuts. For a thick center-cut ham slice, divide into thirds and turn one of the sections on its side, slicing across the grain. Carve each section the same way, removing the bone from the end section before slicing.

A cushion shoulder of lamb or pork is boneless and easy to carve. Make slices about three-eighths inch thick through the meat and stuffing.

A picnic shoulder may be carved in the same way as a ham or lamb leg.

A half ham (shank-end) is carved by removing the cushion section, turning it on the cut side and making slices, beginning at the large end. For additional servings, separate the remaining section from the shank by cutting through the joint. Remove the bone, turn, and slice.

A beef brisket is placed for carving with the round side away from the carver. Excess fat may be trimmed off before carving. Make thin slices in rotation from the three sides, carving at a slight angle, thus making all cuts across the grain.

To carve a beef tongue, slice off excess tissue and cartilage from the large end. Then make thin parallel slices lengthwise from the small end and crosswise of the thick portion.

The crown roast of lamb is made from the rack or rib section. A crown roast of pork is made from the rib sections of two loins. These roasts are carved similarly to a pork loin roast.

Hold the roast by placing the fork firmly between the ribs on the left side. Cut down between the ribs, allowing one rib to a slice. Lift the slice on the knife blade, using the fork to steady it.

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XV · Gelatin and Its Use in Food Preparation

Gelatin is a purified food product containing a single protein. It is formed by heating in water bones and animal tissues containing a protein called collagen.

In dry form gelatin is a clear, amorphous substance with a yellowish tinge. It is insoluble in cold water but dissolves in hot liquids, 95° F. or above. While gelatin will dissolve when added directly to hot water, it goes into solution more quickly after soaking in cold water. This preliminary soaking causes it to swell and increase the surface exposed to the solvent action of the hot liquid.

On cooling, solutions of gelatin thicken and if they are sufficiently concentrated (about two per cent) a semisolid mass called a "gel" is formed. This characteristic makes gelatin useful in food preparation.

SOURCES

In the home, gelatin is formed during the making of meat soups. The long, slow cooking required to extract the flavor in making meat stock changes the collagen present in connective tissues, tendons, and bones to gelatin. These soups usually contain sufficient gelatin to form a gel when cold. Veal joint bones are used in making soups when a high gelatin content is desired.

Before gelatin was generally available commercially, it was prepared at home for use in desserts from the foot bones of a calf. In a young animal these bones are rich sources of collagen. Old cookbooks often refer to desserts prepared from "calf's-foot jelly."

Commercial Gelatin. Gelatin is now a by-product of the meat-packing industry. It is prepared by hydrolysis of the collagen from parts not useful for other purposes, such as tendons and bony pieces, high in cartilage and connective tissue. This hydrolysis begins at 176° to 196° F. and is hastened by use of higher temperatures or by boiling with acid. In the commercial manufacture of gelatin, low temperatures are used, and no acid, since the more drastic treatment tends to break down the gelatin into simpler products which would not form a gel.

COMPOSITION AND NUTRITIVE VALUE

Gelatin is not a complete protein. It lacks two important amino acids and two others are present in smaller amounts than are necessary for tissue building. Since the amount used in most dishes is small, gelatin does not, in itself, make any important nutritive contribution to the diet. It is useful, however, in the preparation of attractive and palatable dishes from other foods. The food value of gelatin dishes depends largely upon the added ingredients.

SELECTION AND BUYING

Gelatin is on the market in sheets and in granulated and pulverized forms. The sheet gelatin is the least expensive form but it can be purchased only in bulk. Sheet gelatin is rapidly being replaced even for institutional use by the more convenient granulated and powdered forms.

Gelatin is available in convenient-size packages for household use in powdered form, either plain or acidulated. In this form it is easily measured and dissolves readily. It is available also in prepared mixtures which contain, besides gelatin, sugar, acid, synthetic fruit flavors, and coloring. These require only the addition of water to make a plain flavored jelly for use as a dessert or a salad base. The ready-to-prepare gelatins come in a variety of flavors, and in package sizes adapted for either household or institutional use. Unless fruit juices are added in their preparation, desserts made from these mixtures have little food value except for the small amounts of gelatin and sugar present.

USES IN FOOD PREPARATION

Gelatin has many uses in food preparation. It gives special texture to candies (p. 43) and ice-cream mixes (p. 157). The gelatin formed naturally in making meat soups improves the consistency and gives body to hot soups and forms a gelled cold consommé. Soups not prepared from meat stock require the addition of gelatin if they are to be served in gelled form.

Gelatin is used in making desserts, salads, and special molded dishes from cold meats. In the gel form well-flavored liquids become something to eat rather than to drink and are more convenient to serve. When other materials are added to a gelatin base a wide variety of dishes is possible. In the preparation of these mixtures, whether soups, meat dishes, desserts, or salads, the same general rules apply.

The aim is to obtain a product that will hold its shape but be tender and not too firm at serving temperature. When cut with a spoon the mold should offer little resistance and quiver "like a bowlful of jelly."

Proportion of Gelatin. The consistency or stiffness of the gel at a given temperature is determined primarily by the amount of the gelatin in the mixture. Very acid mixtures require somewhat more gelatin to obtain a given consistency than the less acid mixtures. An excess of sugar will retard gel formation, but the amounts of sugar used in gelatin desserts are not sufficient to interfere with gel formation. The proportion of gelatin used in these mixtures is based on the amount of total liquid. The amount required will vary with the quality of the gelatin and the amount of acid in the solutions. In general, it will be about two per cent (five grams or ½ tablespoon to each cup of liquid). Slightly less may be used (one and one-half per cent) if the mixture is to be served very cold and contains little acid. Very acid mixtures may require as much as three per cent.

Combining Gelatin with Liquid. Since the gelatin dissolves more quickly if previously softened in cold water or other liquid, add to the dry powder twice as much liquid by volume as there is gelatin. It is undesirable in some cases to heat all the remaining liquid. Heating causes undesirable flavor changes in fresh fruit juices and increases the time necessary for the mixture to reach the temperature for gelation. To save time and flavor, heat only enough of the liquid to dissolve the gelatin and add the remaining liquid to the mixture after the gelatin is completely dissolved.

Setting Time. The time required for the mixture to gel will vary with the temperature. Setting time is longer at temperatures around 50° F. than at refrigerator temperature, but when sufficient gelatin is present the mixtures will gel at cool room temperatures. When for any reason it is important to hasten the setting time, this can be done by placing the mixture at a low temperature.

The concentration suggested (2 per cent) will not form a gel at temperatures above 95° F., but at a temperature of 50° F. or below should set in two to four hours. It will set sooner at lower temperatures. A somewhat less concentrated solution of gelatin (1 teaspoon to each cup of liquid) will form a gel at a temperature a few degrees above freezing. Mixtures that do not form gels at temperatures above 50° F. are not satisfactory since they tend to liquefy during serving.

Acid may lengthen the setting time unless the amount of gelatin is increased. When more than 2 tablespoons of lemon juice or vinegar are used to each cup of liquid, the proportion of gelatin should be increased.

After a gel has once formed, it may be warmed to several degrees above the gelation temperature before it liquefies. When a gelled mixture has liquefied as the result of a rise in temperature, it will gel again when the temperature is lowered.

Gelatin dishes cannot be made with fresh pineapple, since there is an enzyme present in pineapple which digests gelatin and destroys its jellying power. When fresh pineapple is to be used it should be heated to destroy this enzyme. Canned pineapple has been heated and so does not have this effect.

Texture of Gelatin Mixtures. As gelatin-containing solutions cool they become thick so that they hold air beaten into them. If they are beaten when the mixture is thick and viscid, but not gelled, the volume can be doubled from the air incorporated and a spongy texture obtained. If beaten when too thin, the solution does not hold the air, a foam rises to the top, and the mixture gels in two layers.

Whipped cream and beaten egg whites are added to gelatin mixtures to give them a spongy texture. These should be added when the mixtures are at just the right consistency. If too thin, the cream or egg white will tend to float on the top. If too thick, they do not combine to form a smooth mixture.

Adding Fruit and Vegetables. Any fruits and vegetables to be added to gelatin salads and desserts should be carefully drained to remove any excess of water in order to avoid dilution of the gelatin base. They should be added when the gelatin portion is thick but not set. Canned fruits heavy with sugar tend to sink if the mixture is too thin and the fresh fruits and vegetables tend to float. If the mixture has set it is difficult to combine any other material with it smoothly.

When layers of fruit or vegetable are wanted in a gelatin mold, a layer of the mixture is poured into the mold and placed in the refrigerator to harden while the remainder is kept at room temperature. The fruit or vegetable is then arranged on the hardened gelatin and another layer of the mixture poured over to harden. This is repeated until the mold is full.

Gelatin Desserts. Many attractive desserts are made with gelatin.

Plain jellies are made of fruit juice, water, sugar, and gelatin. Fruit, whole or in pieces, may be added to plain jelly.

For approximately a quart of plain lemon jelly, use 2 tablespoons gelatin soaked in $\frac{1}{4}$ cup of cold water; add to this $2\frac{3}{4}$ cups boiling water and 1 cup sugar. When cooled add $\frac{1}{2}$ to $\frac{3}{4}$ cup lemon juice, a little grated rind, and $\frac{1}{4}$ teaspoon salt.

This basic recipe can be modified by decreasing the lemon juice to $\frac{1}{4}$ cup, the boiling water to $1\frac{1}{2}$ cups, and adding $1\frac{1}{2}$ cups of fruit juice or a mixture of juice and pulp. If the juice is sweet use less sugar. When orange juice is used, a little grated peel improves both texture and flavor.

Snows or sponges have stiffly beaten egg white folded into the plain jelly. Use 2 to 3 egg whites to the above recipe for plain jelly. Lemon snow served with custard sauce is a favorite. A spongy mixture similar to a snow can be prepared by beating air into a plain jelly as directed on the next page.

Spanish creams are made by setting a soft custard with gelatin and adding stiffly beaten egg white.

To make the custard use 1¾ cups milk, 3 egg yolks, and ½ cup sugar (see page 110). Soak 1 tablespoon of gelatin in ¼ cup of milk. Add to the hot custard and stir until the gelatin is completely dissolved in the custard. Add any flavoring extract and set aside to cool. When slightly thickened but not set, fold in 3 well-beaten egg whites. This gives the characteristic spongy texture to these mixtures.

Bavarian creams are prepared like Spanish creams, from a jelled custard, but instead of the egg whites one cup thick cream is whipped and folded in last. This may require some additional sugar.

Charlotte Russe is made by adding cream thickened with gelatin to whipped cream. Good proportions are 1 tablespoon of gelatin softened in 3 tablespoons cold cream and then dissolved in ½ cup of hot coffee cream. Cool the mixture and fold it carefully into 2 cups heavy cream whipped until stiff, sweetened and flavored with vanilla.

Charlotte Russe is traditionally hardened in molds lined with lady fingers or thin slices of sponge cake. It may have candied fruits or seeded fresh white grapes added just before it sets.

Fillings for chiffon pies are made on a gelatin base. In this case, after the beaten egg white or whipped cream is added to the partially set custard, the mixture is poured into a baked pie shell and put in a cold place to harden. These pies are always served cold.

To make a lemon chiffon pie use 1 tablespoon of gelatin softened in ¼ cup water, 4 eggs, 1 cup sugar, ½ cup lemon juice, the grated rind of 1 lemon, and ½ teaspoon salt. Over hot water, heat the lemon juice and rind, ½ the sugar and the egg yolks until just thick, add the softened gelatin and stir until dissolved, add salt to the egg whites and beat until stiff. Then add carefully the remainder of the sugar and fold the mixture into the cooled mixture containing the yolks. Pour into baked pie shell and cool. Serve with a covering of whipped cream.

Gelatin Salads. For molded salads, the base is a well-flavored mixture containing gelatin, to which the fruit, vegetables, or meats are added.

For fruit salads, a plain acid jelly is used to bind the fruit. It should be tart and less sweet than for dessert use. The fruit is added in pieces of convenient size. Only soft fruits, such as canned pears and peaches, that can be cut easily with a fork should be used whole in these salads. They are usually served on lettuce with mayonnaise or a cooked dressing.

Tomato aspic is a frequently used gelatin salad. It is prepared in the same way as a plain gelatin, by using well-seasoned tomato juice for the liquid. Tomato aspic may be served alone on lettuce or with chopped vegetables, or may have chopped vegetables added before the aspic is completely set. Serve with French, mayonnaise, or cooked dressing.

For other vegetable salads any acid gelatin base can be used. A ready-to-prepare lime or lemon gelatin is satisfactory if not too sweet. Plain jellies can be prepared by using various combinations of water, fruit, or vegetable juices with enough vinegar or lemon juice to give an acid flavor. These should have the same proportion of gelatin as the plain jelly, but less sugar, more salt, pepper, and any preferred salad seasoning. Equal quantities of the gelatin base and chopped mixed vegetables are combined when the gelatin is just thick enough to prevent layering of the mixture. These are served on lettuce with any tart, well-seasoned salad dressing.

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XVI · Poultry and Poultry Cookery

In the broad sense, poultry belongs to the group of foods known as meat. Its composition, nutritive value, and principles of cookery place it in this group. In the narrow sense, however, the term *poultry* refers to domesticated birds which are used for food, and includes chickens, turkeys, ducks, geese, guineas, squabs, and pigeons.

In the market, the various types of poultry are classified according to age and tenderness in relation to cooking methods. Chickens, turkeys, ducks, and geese are described under selection and buying.

Enough chicken was produced in the United States during 1947–1948 to provide every man, woman, and child with about 24 pounds a year. In 1943 the production figure for chicken was 28 pounds. From 1925 to 1941 the per capita consumption of chicken varied from 18 to 20 pounds. (See page 222.)

The production and consumption of turkey also are increasing in this country. Average consumption increased from two pounds per person per year in the early 1930's to four and one-half pounds per person in 1947. Other poultry is consumed in small amounts.

COMPOSITION AND NUTRITIVE VALUE

The nutritive value of poultry is comparable to that of other meats.

Proximate Composition. The protein content of poultry varies from 16 to 21 per cent, which is approximately the same as in lean meat. The amount of fat varies, depending on the kind of poultry, its age, and the food it has received. The range is from 2.5 per cent fat in broiling chickens to over 16 per cent in hens. Young geese contain over 36 per cent fat. The fat content of ducks is higher than that of chickens and turkeys. Table XLIII shows the proximate composition of poultry as compared with beef.

Nutritive Value. Not only the amount of protein supplied by poultry is comparable to that of meat, but also the quality of the protein. Like meat, poultry supplies protein, which is excellent for building body tissues.

Table XLIII · *Proximate Composition of Poultry Compared with Beef*[1]

Meat	Water	Protein	Fat	Ash	Fuel Value per Pound
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Calories*
Lean beef	67.00	19.00	3.00	1.00	876
Chicken (broiler)	74.80	21.50	2.50	1.10	492
Hen (fowl)	63.70	19.00	16.30	1.00	1016
Turkey	55.50	21.00	22.90	1.00	1318
Duck	61.10	18.30	19.00	1.30	1290
Goose (young)	46.70	16.30	36.20	.80	1774

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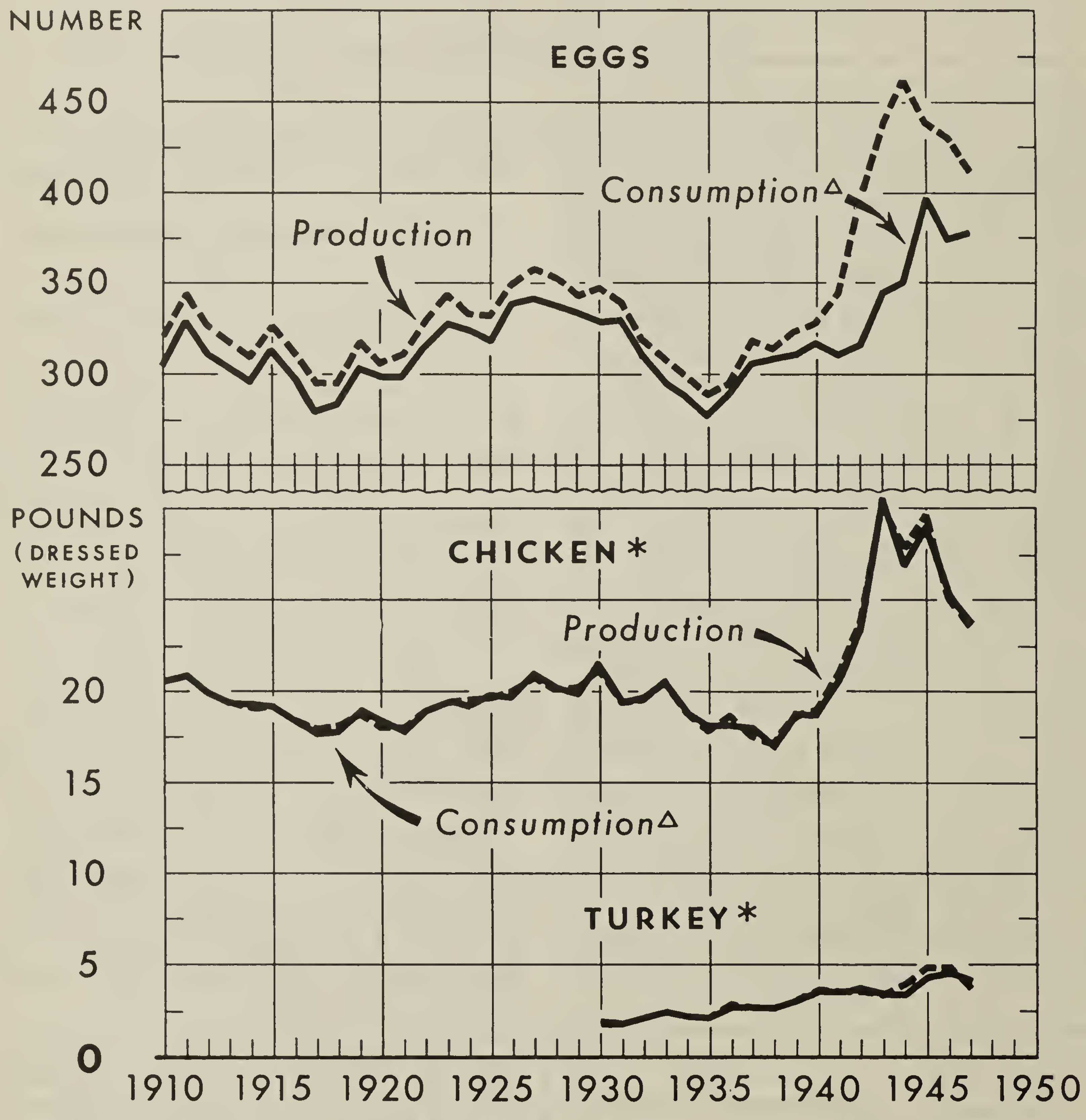
[1] Edible portion.

TOTAL PER CAPITA PRODUCTION AND CIVILIAN PER CAPITA CONSUMPTION OF EGGS, CHICKEN, AND TURKEY, UNITED STATES, 1910-47



*DRESSED WEIGHT DATA FOR 1947 ARE BASED ON PRELIMINARY INDICATIONS

△CONSUMPTION 1941-47 APPLIES TO CIVILIAN POPULATION ONLY

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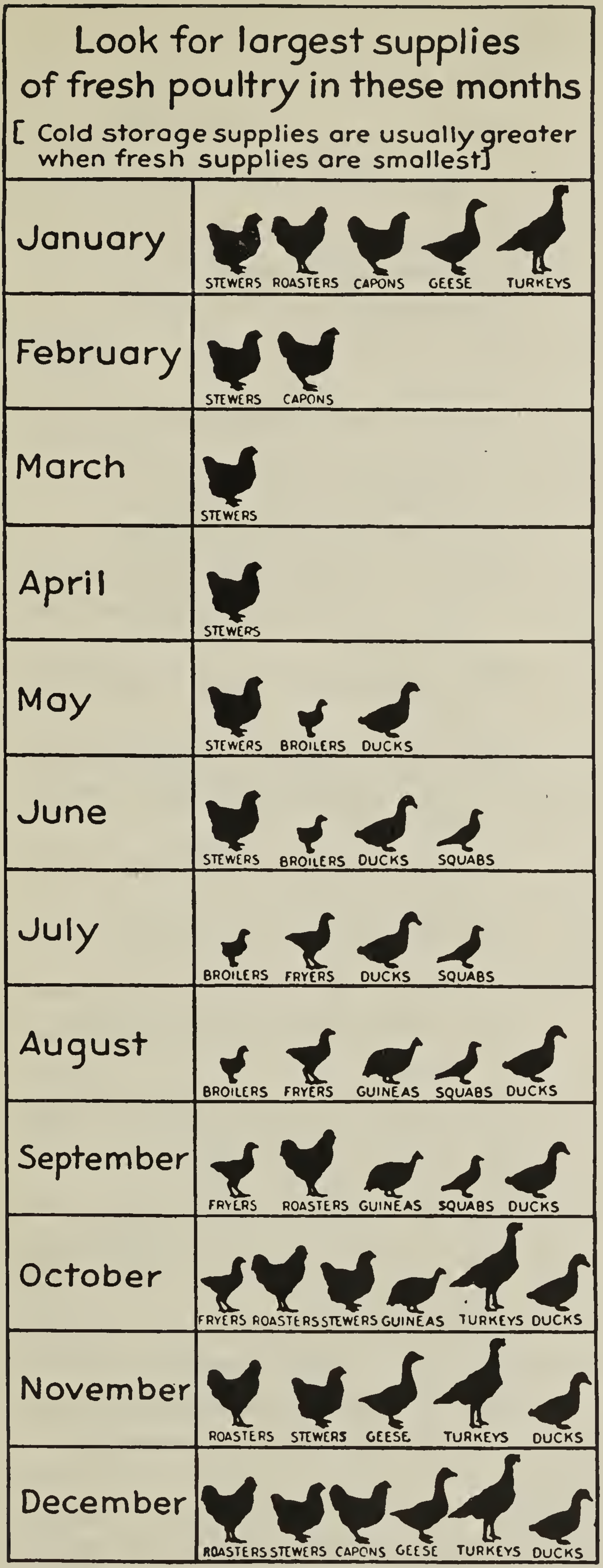

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Fresh Poultry Calendar

The energy value is dependent upon the fat content of the bird, varying from under 500 calories a pound in broiling chickens to over 1000 in mature hens, and approximately 1800 in geese.

Poultry, like meat, is a good source of iron and phosphorus and the important B vitamins. In general the dark meat is a better source of minerals and vitamins than the light meat.

Like other meats, poultry is readily and completely digested. The light meat of chicken and turkey is more tender than the dark meat, since the fibers are shorter and are held together less firmly with connective tissue. This characteristic, together with a lower fat content, causes the white meat of poultry to be more easily digested than the dark.

MARKET CLASSES

Different kinds of poultry and birds of different ages and sex have different characteristics. For convenience in marketing, each group has been given a class name. The names are listed below with the range of dressed weight and the characteristics that adapt each class to special methods of cooking. These names should always be used when buying poultry.

I. *Chickens*

A. Under 1 year old—tender meat

1. Broilers: 1 to 2½ pounds (either sex, 8 to 12 weeks old)
   Require ¼ to ½ bird for each serving
   Very little fat
   May be fried or roasted, as well as broiled
2. Fryers: 2½ to 3½ pounds (either sex, 14 to 20 weeks old)
   Require ¾ to 1 pound for each serving
   Meaty enough to be disjointed, if desired
   Noticeable layering of fat underneath skin
   May be roasted, as well as fried

3. Roasters: over 3½ pounds (male, 5 to 9 months old)
   - Require ½ to ¾ pound to each serving
   - Meaty enough to be roasted whole
   - Excellent layering of fat underneath skin
   - May be fried as well as roasted, especially if covered during part of cooking
4. Capons: 4 to 7 pounds (unsexed male, 7 to 10 months old)
   - Require ½ to ¾ pound for each serving
   - The top in finish, flavor, and tenderness
   - Full-breasted, yielding high proportion of white meat
   - Top price
   - Perfect for true roasting
5. Pullets: 2½ to 5½ pounds (young hen, 4 to 9 months old)
   - Require ½ to ¾ pound for each serving
   - Similar to roasters except body shorter and plumper; often marketed as fryers
   - May be fried, especially if covered during a part of cooking

B. One year old and over—less tender meat

1. Stags: any weight (male birds showing some maturity)
   - Require ½ to ¾ pound for each serving
   - Similar to roasters, except more mature
   - Coarse skin; spurs developing
   - May be braised or stewed
2. Fowls: 4 to 6 pounds usually, but may be any weight and age over 1 year (mature hen)
   - Require ¼ to ¾ pound for each serving
   - Thick, coarse skin; breastbone no longer flexible
   - High proportion of fat underneath skin
   - May be braised or stewed
3. Cocks: usually 4 to 7 pounds, but may be any weight and age over 1 year (old roosters, rarely found in market)
   - Require ¼ to ¾ pound for each serving
   - Dark, coarse, tough meat
   - Lowest in cost
   - May be stewed and used for soup

II. *Turkeys*

A. Under 1 year old—tender meat

1. Broilers: 3 to 7 pounds (either sex, rarely found in market, a luxury item)
   - Require ¼ small bird for each serving, or one piece disjointed
   - Very little fat
   - May be fried and roasted as well as broiled
2. Roasters: 8 to 25 pounds (either sex, 5 to 11 months old)
   - *a.* Young hens: 8 to 15 pounds
   - *b.* Young Toms: 8 to 25 pounds
   - Require 1 pound New York-dressed weight or ¾ pound full-dressed for each serving
   - Hen turkeys are smaller than Tom turkeys
   - Hen turkeys mature quickly and are usually better-finished than Toms of same weight
   - Tom turkeys are at their best at 16 pounds and above
   - May be true-roasted (open pan)

B. One year old and over—less tender meat

1. Hens: 15 pounds or over (any age from 1 year)
   - Require ¾ to 1 pound for each serving
   - Breastbone no longer flexible
   - May be fat, but not tender
   - Must be covered during roasting
2. Toms: 16 to 25 pounds and above (any age from 1 year)
   - Require ¾ to 1 pound for each serving
   - Breastbone no longer flexible
   - Must be cooked by moist heat, or by a combination of dry and moist heat

III. *Ducks*

A. Young—10 weeks to 9 months old, tender meat

1. Ducklings: 2 to 4 pounds (8 to 12 weeks old)
   - Require 1 pound or more for each serving
   - Roasted

2. Western ducks or young ducks: 4 pounds and over (4 to 9 months old)
   Require 1 pound for each serving
   Roasted

B. Old, mature, less tender meat

1. Ducks: 3 to 5 pounds or above
   Require 1 pound for each serving
   Braised (roasted with cover on)

IV. *Geese*

A. Up to 1 year old—tender meat

1. Young geese: any weight (5 months up to 1 year)
   Require 1 pound for each serving
   Fat
   Roasted

B. Over 1 year old, less tender meat

1. Geese: any weight
   Require 1 pound for each serving
   Windpipe no longer pliable but hard and rigid
   Very fat
   Braised, steamed, roasted with cover

SELECTION AND BUYING

Poultry comes to market in different forms. It used to be purchased "on foot" and still is in many rural markets with inadequate refrigeration facilities. But now in most markets poultry is sold dressed. "Fresh-killed" dressed poultry may come from local producers or, "ice-packed," from near-by processing plants. Poultry to be shipped long distances or held in storage is frozen.

Market Forms. Poultry may be just dressed or dressed and drawn. The relative amount of edible meat will vary with the form in which poultry is purchased, and this difference is reflected in the price per pound.

Market-dressed or *New York-dressed* poultry has been bled, picked, but not drawn (eviscerated), and the head and feet are left on. Many plants sell fresh-killed poultry in this form. Unpackaged, hard-frozen poultry is shipped in this form. It must be thawed if the bird is to be drawn at the market. The price of market-dressed poultry is based on the weight of the bird before evisceration and includes the weight of the head and the feet.

Ready-to-cook poultry has been bled and picked, and the head and feet and all viscera have been removed. The carcass and the giblets (liver, gizzard, and heart) are thoroughly cleaned. Most markets will draw and clean any market- or New York-dressed poultry for customers on request. In some markets there is a small charge for this service. (For preparing New York-dressed poultry for cooking see page 228.)

Ready-to-cook poultry may be "fresh killed," or hard-frozen, market-dressed poultry, thawed and eviscerated at the retail store. To an increasing extent poultry is drawn, packaged, and frozen at the point of production, shipped frozen, and should remain frozen until thawed for cooking. The selling weight of the drawn bird does not include viscera, head, or feet, so that the price per pound must be proportionately greater.

Cut-up chicken, ready for cooking, is available on many markets. It may be fresh-killed or frozen. The price will vary with the part. The choice pieces sell at higher prices than the less meaty ones.

Half and quarter turkeys can be had for the family dinner at Thanksgiving and Christmas. The modern turkey is much larger than the wild bird domesticated by the American Indian, and is too large for the needs of

Half Turkey

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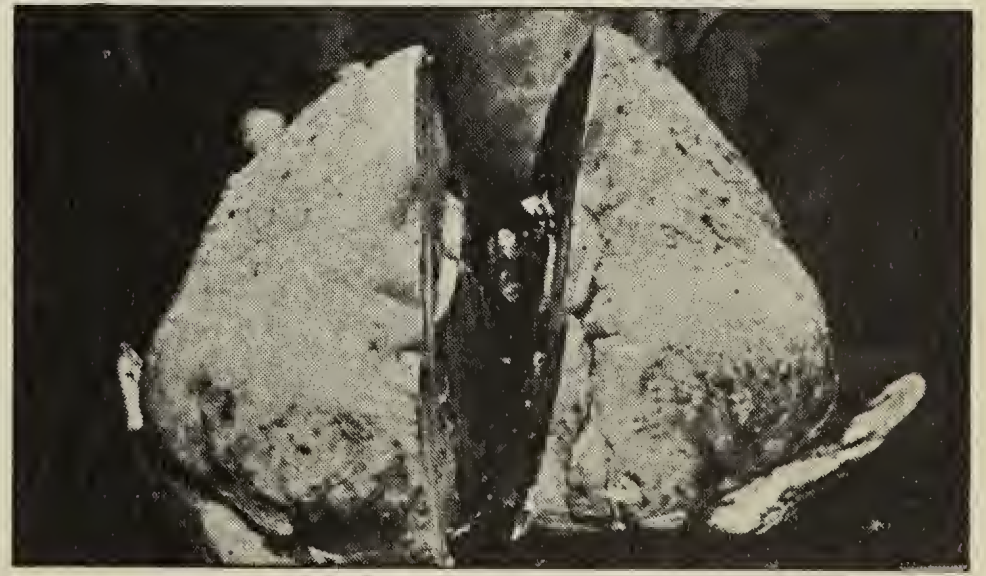


U.S.D.A.

Divided into Quarters

the small family and the facilities of the average apartment-house dweller for cooking and storage. To meet this situation, the larger birds are divided into half or quarter turkeys. Methods have been worked out for roasting these with "stuffing" for the traditional feasts.

Cross-cut and *boneless turkey steaks* are available for off-season use, and in a few places they have rivaled fried chicken in popularity. These forms freeze and ship well and offer a satisfactory method of distribution for overlarge birds.

Cooked poultry is more and more available in some city markets where there are many apartment dwellers. It is not uncommon in such markets to find roast chickens at any time; and roast turkeys, half or whole, roast ducks, and geese appear at certain seasons. With less help in most homes than formerly and with many professional women also performing the tasks of homemakers, the amount of cooked poultry on the market will probably increase.

Smoked turkey is available in markets catering to a selected trade. In most cases this cured poultry is also cooked, but that should be determined before purchasing.

In some farm homes poultry is being cured and smoked, both for home consumption and for sale.

Quality Grades. As the poultry industry has expanded, an optional government service has been provided for health inspection, grading, and labeling of poultry, similar to that of other meats, with letter-grade designations. This service has just been streamlined and revised. The new specification for Grades A, B, and C for edible poultry products were published in the Federal Register, November 15, 1949, and became effective January 1, 1950.

The factors important in determining the quality of poultry are the amount and tenderness of the flesh, enough but not too much fat, and freedom from bruises or any discoloration. Proper dressing is important to the appearance and maintenance of quality in the bird. Until graded poultry is more generally available on the market, the consumer should learn to check these qualities for herself. The younger birds are more tender but have less edible meat to bone. In young poultry the tip of the breastbone should be flexible. A plump, well-rounded body (good conformation) is desirable. Some underskin fat is an aid to cooking; too much internal fat tends to be wasteful. The skin should be clean, smooth, and pliable, with no bruises or discolorations and few pinfeathers.

Amounts to Buy. The weight range for the different kinds of poultry has been indicated under the various market terms for the different kinds, ages, and weights. The amounts suggested per serving vary from one-fourth pound to one pound or over, depending upon (1) the kind of poultry, (2) the market form of the bird, (3) the method of cooking, and (4) the style of service. For example, to make generous servings of most roast poultry, one pound per serving is needed of New York-dressed weight. On this basis there will be some meat left, in most cases, to use in creamed dishes, hash, croquettes, timbales, loaves, sandwiches, or other left-over dishes. Obviously, less will be needed of full-dressed and cut-up poultry which is ready for cooking.

Price of Poultry. Any comparison of prices of poultry in different forms must be made in terms of the amount of edible meat the bird contains. This will vary with the kinds and the market classes. In general, the larger birds yield more edible meat to bone than the smaller. Ducks and geese have a relatively larger proportion of bone and fat, and so yield less edible meat in proportion to total weight than chickens and turkeys. The price will vary with supply, the kind and class of poultry, and the form in which it is purchased.

During the time of the year when male chicks are being separated from young flocks intended for egg production, the price of broilers may be somewhat lower because of increased supply. When flocks are culled in the fall to eliminate the poor layers, stewers are a good buy. These differences in supply are largely a by-product of the egg-producing side of the industry. The poultry meat industry tends to plan its production for estimated demand, and to use frozen storage to even off small fluctuations in the market.

When poultry is bought on foot, the price per pound should be less than for New York-dressed, because live poultry loses 10 to 12 per cent in dressing. New York-dressed should be priced lower than fully drawn or ready-to-cook poultry, as the loss in drawing, including the removal of head and feet, is around 20 to 25 per cent.

Top price is justified on ready-to-cook and cut-up poultry, since it requires no further work in the kitchen to prepare for cooking. In cut-up poultry, breasts and thighs bring a higher price than the less popular portions. Wings, backs, and necks often sell at prices that make them a good buy even allowing for their bone waste.

CARE AND STORAGE

Like most other protein foods, poultry is very perishable. Unless properly cared for and kept at a temperature low enough to prevent the growth of undesirable bacteria, it will spoil readily.

Refrigeration. All poultry, both uncooked and cooked, should be refrigerated at low temperature with as little lapse of time as possible when not under refrigeration.

Uncooked Poultry. New York- or market-dressed birds which are not frozen may be kept up to one and a half days, wrapped loosely in waxed paper and stored in the coldest section of the refrigerator. It is best, however, to draw the birds immediately and wrap in waxed paper, and then to store at 32° to 40° F. Do not hold longer than 24 hours, if possible. Market-dressed and ready-to-cook poulty received hard-frozen may be kept satisfactorily up to three days, wrapped in waxed paper, if it is not already individually packaged, and stored in the coldest part of the refrigerator. At the end of this period the bird will be completely defrosted and should be cooked immediately. Once defrosted, poultry should not be refrozen.

Packaged, ready-to-cook, hard-frozen poultry may be stored 6 to 9 months at 0° F. or below.

Cooked Poultry. It is important to refrigerate all cooked poultry promptly after the meal. Cover it well to prevent drying out and absorption of odors from other foods. When a bird has been stuffed, remove the stuffing and store it separately, well covered. Both the bird and the stuffing will chill more rapidly if the stuffing is taken out of the bird.

It is important, too, to refrigerate gravy and pan drippings and not to permit them to stand in a warm kitchen.

Cooked poultry always should be used as promptly as possible even when properly refrigerated. It tends to dry out and may lose its fine flavor. In preparing it for service, heat only enough for the meal and heat it thoroughly.

Creamed chicken and turkey are particularly perishable. To avoid waste and also to avoid the risk of food poisoning, prepare in amounts for immediate service. Any left-over creamed chicken may be stored in the freezing compartment for a short time.

Smoked poultry, uncooked or cooked, like smoked meat, should be refrigerated. To prevent drying out, taking up odors and flavors from other foods, or transferring its own odor and flavor to other foods, smoked poultry always should be well covered before refrigerating.

PREPARATION AND COOKERY

Eviscerated or full-drawn poultry and cut-up poultry are practically ready for cooking when purchased. Drawn chickens may need to be cut up; this will depend upon the method of cooking and serving. Either may need washing. Market-dressed poultry will have to be drawn and groomed for cooking.

Preparation for Cooking. In preparing a market-dressed bird, the first thing to do is to singe it by holding a short distance above a low gas or other flame until the skin is free of any fine hairs and down. In singeing the bird, change its position rapidly so as not to let the heat injure the flesh.

Next remove the head with a sharp, thin knife; then the feet, by cutting just below the knee joint, taking care to avoid cutting the tendons. Place one leg at a time over the edge of the table at the cut and press down quickly to break the bone. A foot and tendons then can be removed by pulling with the right hand while holding the bird firmly with the left. In old birds, it is necessary to remove the tendons one at a time by running a metal skewer under each tendon and pulling hard to loosen it. The tendons should be removed from turkeys before the feet are removed. Then the bird should be scrubbed thoroughly, with a soft brush if necessary. A mild soap is sometimes needed to clean old birds, especially geese.

To remove the pinfeathers—the little undeveloped feathers protruding just the tiniest bit—pull them with a strawberry huller or small tweezers, or remove them with the tip of a pointed knife. Pressure against the flesh at the base of each pinfeather with the dull edge of the knife also helps to push them out.

Next, cut the skin at the back of the neck down to the shoulders and insert the fingers to pull out the windpipe; then the crop. Push the neck skin back and cut off the neck, leaving the extra skin to fold under and make a neat finish. The pinions of the wings may be removed or not as desired. In dry-heat cookery these tend to harden.

To draw the bird, make an incision through the skin between the end of the breastbone and the vent, either in line with the breastbone or at right angles to it, just large enough to insert the hand. Reach in and locate the gizzard, which is easily felt. It may be grasped firmly and all the viscera removed including the heart, liver, and intestines. Take care not to break anything, especially the gall bladder, which lies on the under side of the right lobe of the liver.

To free the intestines, one may cut around the vent with scissors. Then remove the lungs, which lie tight against the backbone near the neck of the bird, and the kidneys, which lie in the hollows, one on each side, near the end of the backbone, and the oil sack which lies on top of the tail piece.

Discard the viscera except the heart, liver, and gizzard. These are the giblets. The fat, membranes, arteries, veins, and clotted blood should be removed from the giblets, and the gall bladder cut carefully from the liver, with any of the liver which appears green. The bile, which is the green fluid in the gall bladder, will give a bitter flavor to anything it touches. The gizzard is cleaned by first cutting through the thickest part just to the tough, whitish, inner lining, taking care not to cut this lining. The inner sack then can be pulled loose, intact, and discarded.

The entire bird, inside and out, and the giblets should be washed in running cold water, drained, and wiped dry with paper toweling. The bird is now ready for stuffing and cooking whole; or it may be cut up as desired for the particular method of cooking which is to be used.

When a bird is disjointed for frying, braising, or stewing, the disjointing may be done before the viscera are removed.

FOR BROILING. Split each bird in half lengthwise, through the backbone and the breastbone; or remove the backbone and split the bird in halves or quarters.

Very small birds may be split down the back only, flattened and broiled whole.

FOR FRYING. 1. *Fourths.* Prepare as for broiling. Then cut each half into two servings.

2. *Disjointed pieces.* Bend each leg from the body and separate it by cutting the skin free and bending the leg back at the hip joint until the joint breaks. Then cut the leg loose from the body and separate the drumstick from the thigh at the joint. To do this, bend the joint and cut on the bend.

Cut wings free at the joint next to the body.

Cut the neck free from the body if this has not been done previously. Then, starting at the body opening, cut upward toward the neck through the small rib joints, thus separating the back from the breast. Separate the lower breast from the "wishbone," and divide the back into two pieces by cutting crosswise. Remove the oil sack if this was not done earlier.

FOR ROASTING. Leave the bird whole. Stuff, if desired.

FOR BRAISING. To prepare individual servings for braising, such as a fricassee of chicken, disjoint as for frying.

When a mature bird is to be stuffed and browned to resemble roast poultry, after tendering by moist-heat cookery, it is left whole.

FOR STEWING. Leave whole if stewing for creamed poultry or for salad. Disjoint for serving as stewed chicken.

DEFROSTING POULTRY. Complete defrosting of frozen poultry before cooking is best. It is then cooked in the same ways and for the same lengths of time as fresh chilled poultry. In the refrigerator, in original moisture-proof wrappings, frozen chicken will require from overnight to one and one-half days to defrost. At room temperature, wrapped in original moisture-proof wrapping, it will require from two to six hours.

Other frozen poultry may be defrosted in the same way as frozen chickens. Turkeys, being larger, require longer defrosting time.

Prompt cooking after defrosting is preferable, but defrosted ready-to-cook birds can be wrapped loosely in waxed paper and held at 32° to 40° F. for 24 hours before cooking, if necessary.

Principles of Cookery. The basic principles involved in cooking poultry are exactly the same as in all meat cookery. As shown in Chapter XIV, high temperatures have little place in meat cookery, since intense heat hardens and toughens protein, shrinks the meat, and squeezes out the juices. This is just as true with poultry as with other meats. On the other hand, low to moderate cooking temperatures are best, regardless of the kind or age of the bird, or the method of cooking. Low to moderate heat is economical of both poultry and fuel, cooks the poultry uniformly, makes it tender, and keeps it juicy.

Also, like other meats, poultry should be cooked according to its tenderness, which is dependent upon the age and fatness of the bird. In general, tender birds may be cooked by dry heat, while less tender ones must be made tender by moist heat. Young, well-fatted, tender birds are best when cooked by broiling, frying, and open-pan dry roasting; young birds which are very lean, and mature birds past their prime for tenderness yet not in the stewing class, are best when cooked by braising in a covered frying pan, casserole, or covered roaster. Very old birds need long, slow cooking, covered with liquid or steam; and are best, therefore, when cooked by stewing.

These two basic principles, cooking at low to moderate temperature, and cooking according to tenderness (age and fatness), hold for fresh-chilled, frozen, and smoked poultry. There is no difference in the cooking of fresh-chilled and frozen-defrosted birds.

METHODS OF COOKING

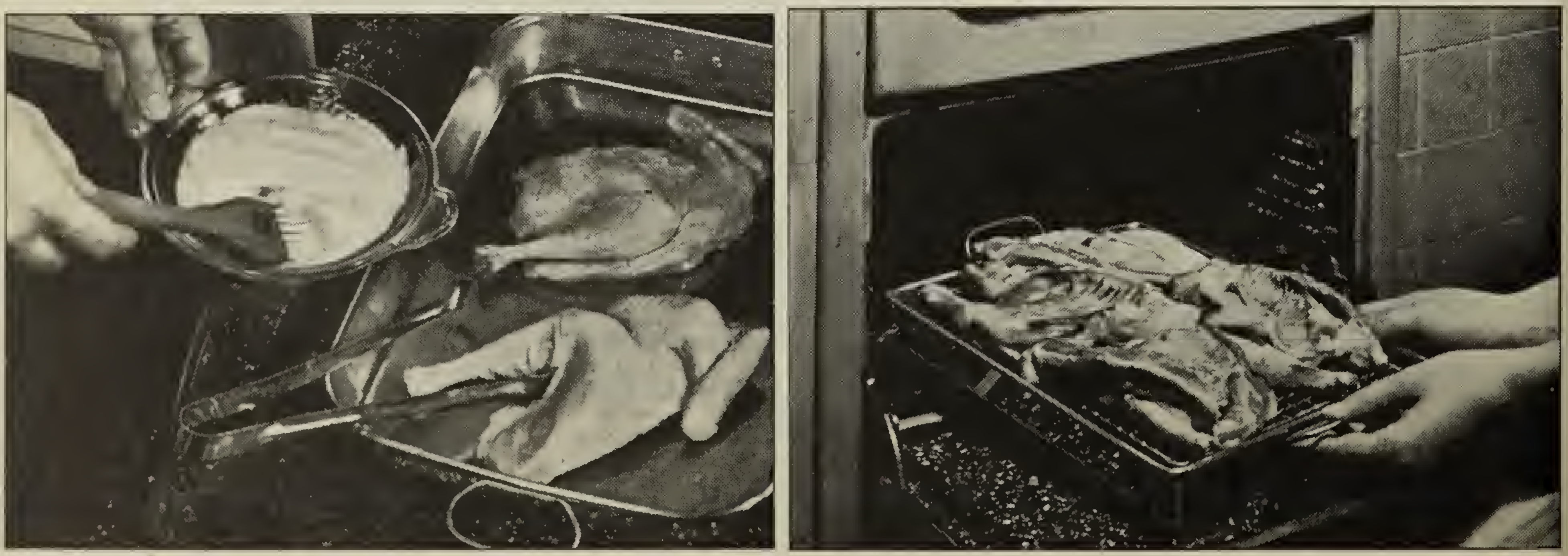
By using the foregoing principles the various types of poultry may be broiled, fried, roasted, braised, stewed, or steamed. Many poultry dishes are variations of these methods. In some cases, also, poultry dishes may be made after precooking by one of these methods. For example, creamed chicken and its many variations are made from fowl which first has been cooked by stewing.

Broiling. For broiling, use a tender young bird (see page 223). It may be left whole, split in halves, or cut into quarters. Breaking the joints and removing the wing tips make it easier to manage on the plate. The bird should be wiped as dry as possible, brushed with melted fat, and placed on the broiler rack with the skin side away from the heat. Place the broiler pan five or six inches from the heat, if possible. Under no condition should the top of the bird be less than four inches from the heat. Broil at moderate temperature for slow, even cooking. Turn the bird several times (about every 10 minutes) as it browns gradually, basting frequently with the pan drippings or with other fat. Cook until tender, nicely browned, and evenly cooked to the bone, the time depending upon the thickness and weight. A two-pound chicken will require 30 to 45 minutes. A combination method of broiler and oven is better for larger birds. A four-pound turkey will require one hour to one hour and 15 minutes; a one-pound squab, about 40 minutes; a one-and-one-half-pound guinea, about 45 minutes; and a two-pound duckling, 35 to 45 minutes.

To test for doneness, cut into the thick muscle of the drumstick to the bone. The meat should cut easily and no pink should be visible. Also, if the bird is done, the joint between the drumstick and the thigh yields easily when it is pressed with a fork. Serve broiled poultry at once, skin side up, with the pan drippings or melted fat poured over it.

There are many variations of broiled poultry. If more convenient, cook the birds partly in the broiler and finish in the

Preparing a Chicken for Broiling · Brush with fat; adjust broiler pan so that chicken is four to five inches from heat



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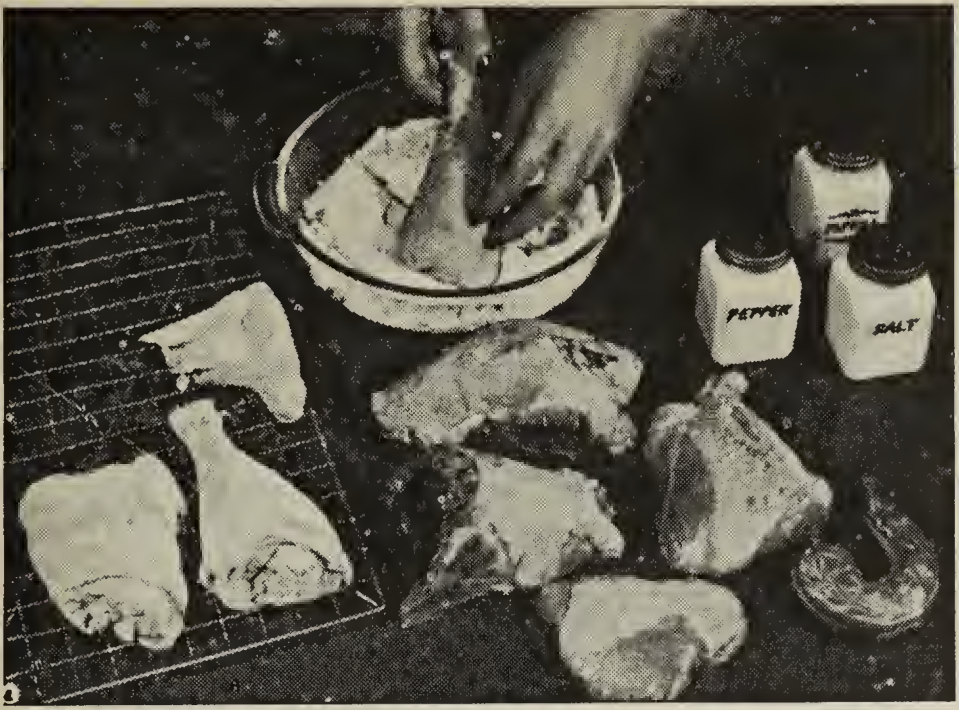

Frying Chicken · (*Upper left*) Rub seasoned flour into pieces of chicken. (*Upper right*) Place in hot fat; turn for even browning. (*Lower right*) If on the tough side, add carefully a small amount of water. Replace cover to hold in the steam

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oven at 300° to 350° F., or start in a moderate oven and finish in the broiler.

When nearly done, the birds may be turned skin side down and the cup-shaped sides filled with stuffing. They are then returned to the broiler or oven to finish cooking and brown the stuffing.

Barbecued poultry may be prepared by basting with a barbecue sauce while broiling.

Frying. Young chickens of any size may be fried. The usual frying size is two and one-half to three and one-half pounds. A two-and-one-half-pound frying chicken may be cut into fourths or disjointed. Smaller birds may be cut into quarters or halves. Larger fryers should be disjointed. The number of pieces depends upon the weight of the bird and the method of cutting.

Chicken is more often fried than other poultry, but other young birds can be fried in the same ways as chicken.

There are two ways of frying poultry: in shallow fat (pan-frying) and in deep fat (sometimes called French frying). In the home, fried chicken is most often cooked in shallow fat.

Before frying, wipe the pieces dry, season with salt and pepper, and roll in flour. Or for a heavier coating, leave the pieces wet or dip them in milk or water before rolling in flour. If preferred, dip the chicken in slightly beaten egg diluted with 1 to 2 tablespoons water or milk and then roll in corn meal or fine crumbs.

A heavy frying pan should be used for frying in shallow fat. Use at least a half inch of fat in the pan and have it only moderately hot, never smoking-hot. Place the coated chicken, largest pieces first, in the fat. Do not crowd the pieces in the pan; leave enough space for the fat to come up around each piece. Cook slowly, at no more than moderate heat, turning the pieces occasionally to insure even cooking and browning. To avoid piercing the muscle fibers of the chicken and permitting the juice to escape, the pieces may be handled with tongs or two spoons.

When more than one chicken is fried, two frying pans may be used, the larger meaty pieces being cooked in one and the thin less meaty pieces in the other. The thickest pieces of a two-and-one-half-pound bird will require about 25 minutes to cook well-done to the bone. Lower the heat if the chicken is browning too fast or it will become hard and dry.

Some "fried chicken" has a heavy coating of flour or corn meal and after it begins to brown it is covered and the heat is lowered. This method, technically, is braising. It is the better method, however, for most chickens of three pounds and over, since covering tightly holds in the steam and makes the meat more tender. In some cases a small amount of water is added to the pan before it is covered. In braising, tenderness is obtained at a sacrifice of crispness. Since many people like crispness in fried chicken, it may be recrisped by uncovering for about the last 10 minutes of cooking. Chickens which need this method to make them tender may need a total of 35 to 60 minutes of slow cooking.

Another variation in the method of preparing so-called "fried chicken" is to cook it in the oven after browning. This method may be more convenient, especially when a large quantity is being cooked, since it requires less watching. When pieces are uniformly and delicately browned in the frying pan, transfer them to a covered roasting pan or casserole, cover closely, and cook in a 300° to 325° F. oven until tender. Uncover for the last 10 minutes for recrisping, if desired. Or if the chicken is young and tender it may be finished in the oven in an open pan.

For cream gravy to serve with fried chicken, blend 3 tablespoons flour with 3 tablespoons drippings and all the little browned bits in the frying pan. Add gradually, with constant stirring, one pint cold whole milk. Cook slowly and stir until the gravy reaches a hard boil and is very smooth, except for the brown bits of crumbs. Season with salt, pepper, and paprika. Serve hot.

To fry chicken or other poultry in deep fat, cut the bird into pieces, as desired, according to its weight and the number to be served. If the joints are broken, the pieces will cut apart easily when cooked. Before cooking, dip the pieces into diluted egg and fine crumbs or into a thin batter (1 cup flour, 1 cup milk, 1 egg, and $\frac{1}{2}$ teaspoon salt) to add flavor and to make a coating which prevents the meat from drying out. Allow the coating to dry a bit before cooking.

Heat fat, suitable for deep-fat frying (see page 146), to 350° F., having enough in a deep kettle to cover the chicken. A frying thermometer which can be clipped to the side of the kettle is very helpful in keeping the fat at the proper temperature. Lower the pieces, one at a time, into the hot fat, taking care not to overfill the kettle. Regulate the heat so as actually to fry the chicken at 300° to 325° F. At this temperature, the quarters of a two-and-one-half-pound bird will need approximately 15 minutes to cook well done to the bone. When the fat is too hot, the pieces brown before the thick portions are cooked through. Deep-fat frying cooks the chicken more rapidly than pan-frying, since both sides are cooked at once. Drain the cooked chicken on paper toweling, and keep hot in a heated pan until served.

If desired, chicken may be lightly browned in deep fat, drained, and finished in the oven at 300° to 350° F. for 20 to 30 minutes. The oven cooking may be done either open or covered, depending upon the weight and tenderness of the bird. There is no gravy to accompany the deep-fat fried chicken.

Roasting. For true roasting, a bird should be both young and fat. (See "Classification of Poultry," p. 224.) Frying chickens, roasters, capons, and pullets may be roasted, also young hen or Tom turkeys, up to one year of age. Farm ducks are good for roasting when from four to nine months old. Green ducks or ducklings, sold on a commercial scale, are often three months old or under. Usually female birds that have begun to lay eggs are no longer suitable for true roasting.

For the way to prepare the bird for roasting see page 228. It is roasted whole, with or without stuffing.

When poultry is roasted the giblets and neck may be cooked by stewing, in simmering, salted water, until tender. The gizzard and heart need moist heat to make them tender; and whatever the style of service they are better if first cooked tender in water. When all the giblets are cooked in water, the heart and gizzard should be started in time to permit one to two hours of stewing, the liver being added about 15 minutes before the others are done. The cooked giblets may be chopped and added either to the stuffing or to the gravy. The stock may be used to moisten the stuffing, or in the gravy, if a dry stuffing is preferred.

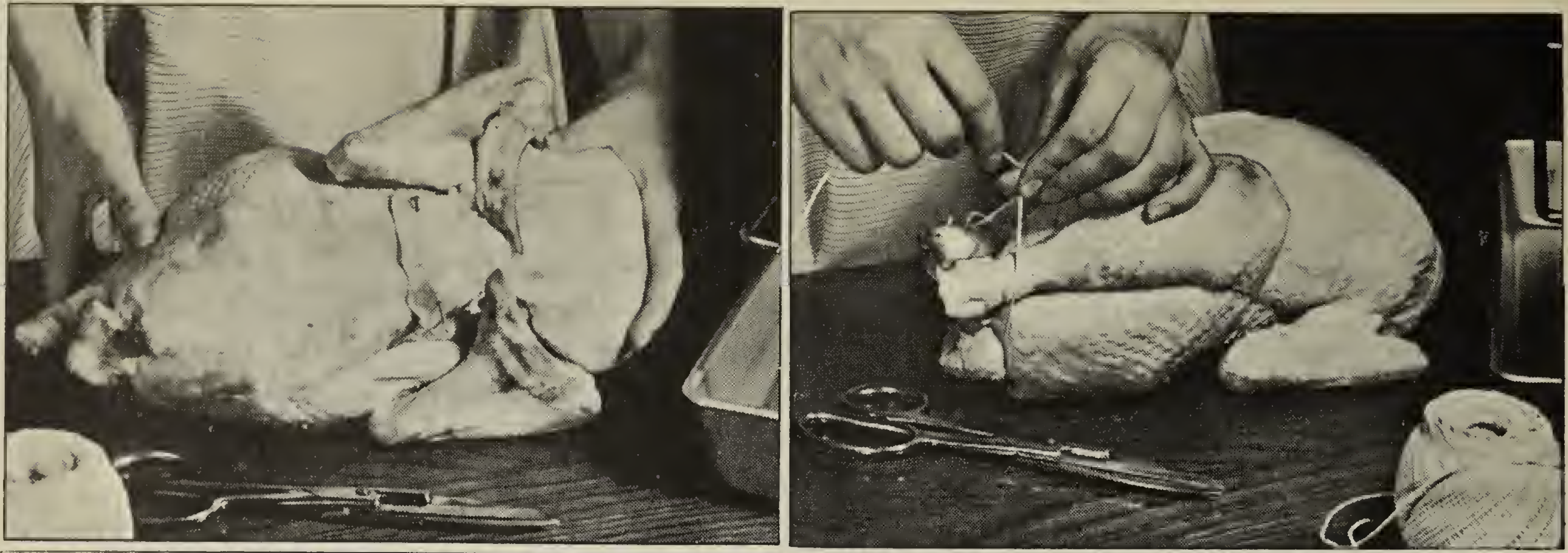
Poultry stuffings are all made on the same general plan. The essential ingredients are (1) a starchy base, usually bread, white, brown, or corn, though it may be boiled rice or mashed potatoes; (2) fat in some form, for richness and flavor and to prevent sogginess; it may be melted butter, margarine, rendered poultry fat, drippings, or tiny pieces of salt pork; and (3) seasonings, including onion, celery, parsley, and herbs, such as sage, savory, thyme, and marjoram. To the essential ingredients many additions are made to stuffings for roast poultry. These include mushrooms, chestnuts (boiled 15 minutes and peeled), oysters, sausage (no other fat is needed), eggs, and dried and fresh fruits. Any meat added to stuffings should be precooked.

There are two schools of thought on stuffings, whether they should be rather dry or have liquid added. The dry type is made from one- or two-day-old bread. The loaf may be cut in two and the inside flaked out with a fork, leaving the crusts for some other purpose; or the crusts may be removed and the loaf grated; or it may be flaked apart with the fingers, either the inside of the loaf or slices, leaving the crusts. This type of stuffing is light and fluffy—seldom soggy.

When moisture is added, drier crumbs may be used or bread that is older. It may be pulled apart or cut into cubes. Moist stuffings sometimes have slightly beaten egg added as a binder. The liquid may be stock from the giblets, hot water, or milk. Too much liquid will make a soggy stuffing.

In making stuffings, there are no hard and fast rules about proportions; amounts of ingredients are much a matter of taste. Basic proportions, however, are these: to 1 quart crumbs or boiled rice, $\frac{1}{4}$ to $\frac{1}{3}$ cup fat, depending upon the fatness of the bird, about 1 cup chopped celery, $\frac{1}{4}$ cup each finely chopped onion and parsley, and salt, pepper, and seasoning herbs to taste. Remember that too little seasoning is always better than too much. For the amount of stuffing needed, figure on about 1 cup of crumbs for every pound of bird. For a five-pound chicken, usually a quart of crumbs, or for a 14-pound turkey, about three quarts of crumbs are sufficient unless more stuffing is desired than will go inside the bird. Boiled rice usually swells more than crumbs. When oysters, chestnuts, or mushrooms are added, decrease the amount of basic material accordingly.

The seasonings may be heated, not browned, in the fat in a large frying pan, and the basic material added and mixed well.



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Trussing a Roasting Chicken · (*Upper left*) After stuffing as directed, bring neck skin to the back and fasten securely. Wings are brought to the back, with tips across the neck skin. This helps to hold it in place. (*Upper right*) Tie skin over leg joints; then bring drumstick ends together and tie securely to the tailpiece. (*Lower left*) Brush with fat. Start breast down

Before stuffing the bird, sprinkle the inside with salt and pepper. Then fill the body cavity with the stuffing. Do not pack it in but allow room for it to expand during cooking, as it absorbs juices from the bird.

It is best to put the stuffing in hot if the bird is to be cooked at once, since this will hasten the cooking. When more convenient to stuff the bird the day before it is cooked, the stuffing should be put in cold, the bird being kept well chilled to prevent any danger of spoiling. If held overnight, the bird absorbs some of the flavor of the stuffing, which may be desirable.

After stuffing turkeys, chickens, or guineas, tuck the legs under the band of skin. A cord may be wrapped around the legs and under the tail to hold the legs close to the body. After stuffing ducks or geese, or any bird with the cut made lengthwise rather than crosswise of the body, sew the edges of the skin together or lace them with twine and poultry pins; then tie the legs close to the body.

Stuff the loose skin at the neck, again without packing, and fold the neck skin to the back and fasten with a skewer or poultry pin.

Fold the wing tips back on the wings to hold them close to the body. Holding the wings and legs close against the body, so that the bird is compact, is called trussing. This is necessary because it keeps the bird in shape during cooking and prevents the wings or legs from overcooking.

To complete a stuffed and trussed chicken, turkey, or guinea and make it ready for the roasting pan, rub the bird with fat. Another method to keep the skin soft is to cover the bird with a cloth dipped in melted fat. Ducks and geese need no added fat; in fact, they are sometimes pricked before and during roasting to let some of the excess fat drain out. The best place for pricking is in the deep fat layers around wings, legs, and thighs.

Place the bird to be roasted, breast side down, on a rack in a shallow open pan. Add no water to the pan. The rack keeps the bird out of the drippings and permits the hot air to circulate around it. A tender bird needs no moisture; therefore, use no water and no cover on the pan.

Roast the bird in a slow to moderate oven—250° to 350° F., depending upon the size: the larger the bird, the lower the temperature. No searing is ever necessary.

When the bird is about half done, turn it breast side up. With a V-shaped rack in the roasting pan, a bird may be roasted the whole time with the breast down. If a cloth dipped in melted fat is used over the bird, keep it on the top and spoon the fat from the pan onto the cloth, to remoisten it if necessary, during cooking.

Groom a half turkey in the same way as a whole turkey. When cleaned and dried, fasten the tail piece and leg together, using a large needle and clean white cord. Keeping the cavity side up, sew the neck and breast skin together. Salt the body cavity formed, and pack loosely with stuffing. This will require approximately one half as much stuffing as a whole turkey.

Cover the stuffing with heavy greased paper—preferably parchment paper—that has been cut to fit the opening. The paper is fastened in place by catching the white cord in the skin, first on one side then the other, and at the same time pulling the skin over the paper, to form a lacing that holds the paper snugly against the stuffing.

Place the half turkey paper side down on the rack in an uncovered roaster and cook in the same way as a whole turkey, except that it must not be turned. When done, lift to the platter, leaving the paper in place. Follow carving directions for whole turkey. The stuffing can be removed from the opening left when the thigh is removed.

A quarter turkey is handled in the same way, except that the paper must cover one end as well as the top of the cavity.

Table XLIV gives the oven temperature and the approximate total time and minutes per pound for roasting different kinds and weights of poultry.

The time required for roasting depends upon the weight of the bird and the oven temperature. The times given in the table are only approximate. The bird must be roasted until it is tender and done to the bone, but it should not be overcooked. When it is done, the flesh is slightly shrunken under the skin, and the drumstick-thigh joints move easily when the legs are picked up by

Roasting a Half Turkey · (*Lower left*) Cover stuffing with heavy paper and fasten paper in securely. (*Upper right*) Place skin side up for roasting. (*Lower right*) Ready to serve

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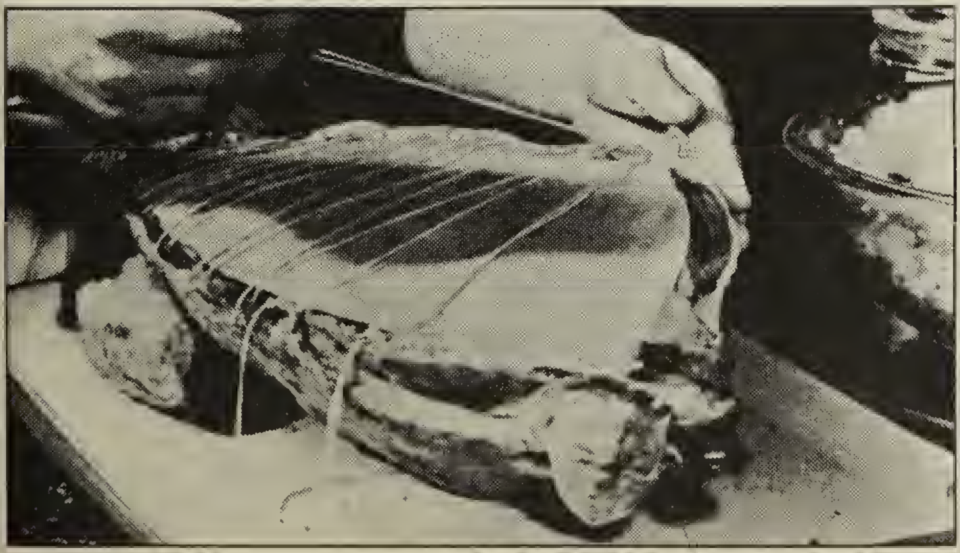

TABLE XLIV · *Timetable for Roasting Young Poultry*[1]

BIRD	MARKET-DRESSED WEIGHT	OVEN TEMPERATURE	COOKING TIME	
			Total	Per Pound
	Pounds	°F.	*Hours*	*Minutes*
Chicken .	3½ to 4	350	2 to 2¾	40 to 45
	4 to 5	325	2½ to 3	35 to 40
	5 to 6	325	3 to 3½	30 to 35
Duck . .	5 to 6	350	2 to 2½	25
Goose . .	10 to 12	325	3 to 4	18 to 20
Guinea .	2 to 2½	350	about 1½	35 to 45
Turkey .	10 to 13	300	3½ to 4½	20 to 21
	14 to 17	275	5 to 6	21
	18 to 23	250 to 275	6½ to 7½	20 to 22
	24 to 30	250	8 to 9	18 to 20

the ends. This shows they will come off easily in carving. The drumstick meat is very soft and tender when pressed between the fingers. (Protect the fingers with a cloth or paper.) Do not pierce the meat with a fork or cut it with a knife to test for tenderness and degree of doneness if they can be determined in any other way. Piercing the muscle fibers or cutting them lets the juices run out.

To guide the inexperienced cook in determining when a roast bird is done, a meat thermometer may be used. (See page 197.) The bulb of the thermometer may be placed in the center of the inside thigh muscle in a large bird. In a bird of any size the thermometer may be inserted in the center of the stuffing through the opening between the thighs. When a roast chicken is done the thermometer in the stuffing will register approximately 180° F., but for a large turkey it will be lower, approximately 170° F. The temperature of the thigh muscle will be higher, at least 185° F.

Take the bird from the oven as soon as it is done. Transfer it to a serving platter and keep it in a warm place.

To make the gravy, pour the drippings out of the roasting pan and let stand a few minutes for the fat to come to the top. Then skim off the fat, leaving the stock. For each cup of gravy needed, measure a cup of stock from the roasting pan and from the stewed giblets, and 1½ to 2 tablespoons flour, with the same quantity of the poultry fat. Place the fat and the flour in the roasting pan and blend well. To this, add the cool or lukewarm stock slowly with constant stirring over low heat. Bring the gravy to a hard boil while stirring. Season to taste with salt, pepper, and paprika, and, if desired, finely chopped parsley or a tiny bit of savory, thyme, or any favorite herbs. Serve very hot.

Braising. Braising is that excellent method of cooking meats which combines the advantages of roasting and stewing (see page 201). It gives the color and flavor of roasted meat, with the tenderness of that cooked in liquid or stewed. It is a moist-heat method of cooking and, therefore, one to be used when the meat is less tender. It is halfway between roasting and frying on the one hand and stewing on the other; therefore it is a good method for cooking those birds which are questionable for roasting or other dry-heat cookery method, yet not tough enough to need stewing. There are a number of ways by which poultry may be braised. Large frying chickens are really braised when they are covered during a part of the frying. (See page 232.)

Smothered chicken is another variation of braising. It is a good way of preparing a lean young chicken. It may be prepared as for broiling or for frying, that is, in halves, in quarters, or disjointed, according to its size. Sprinkle with salt and pepper and roll in flour. Brown in fat, then cover the pan and finish cooking in the oven at 300° F. When the chicken is tender make a cream gravy as for fried chicken. Smothered chicken is never crisp, but if properly prepared is very soft and tender.

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[1] The oven weight of a stuffed bird is approximately the same as the market-dressed weight. For full-drawn birds increase the roasting time slightly. For roasting an unstuffed bird decrease the time given in the table slightly. The time given is based on chilled birds from refrigerators.

When any bird has reached the upper limit of age and tenderness for true roasting and its breastbone is hard almost to the end, or if it is lacking in fat for open-pan roasting, then it is best to cook it in a covered roaster. This, too, is really braising, though the final result is much the same as in roasting, except that the bird will be more tender and juicier cooked by moist heat held in by the cover. No water is needed in the pan for a bird just on the borderline of tenderness.

To braise an older bird, such as a hen up to one and one-half years old, add a small amount of water to the roasting pan, just as for a pot roast (see page 202). The water should not come higher than the rack; add more as needed. Of course the cover should be on the pan during the cooking to hold in the steam. If the bird has not browned by the time it is tender, the cover may be removed for a short time to brown it. The oven, during the entire cooking, should be at the same temperature as for true roasting.

Another method of tenderizing a fully mature bird is to steam it partly done before stuffing and cook it in a covered roaster. Fold the wings back next to the body and tuck the legs into the band of skin under the tail. Place the fowl, breast up, on a rack in a large kettle. Pour boiling water up to the rack, but do not let it touch the bird. Cover the kettle closely and let the water barely boil, adding more water as needed. Steam the bird for one and one-half hours, or approximately half the cooking period. Then remove it from the kettle, stuff it, truss it, cover with fat if needed, place on a rack in the roaster, add a small amount of stock from the kettle, and cover the roaster. Cook in the oven at roasting temperature until tender. If necessary, remove the cover at the last to brown.

This method of cooking less tender poultry might be called "braising in reverse," since, in braising, the browning usually precedes the steaming. Gravy is made in the same way as for roast poultry.

Other ways of braising less tender poultry, especially mature hen and less tender frying chicken, are fricassee of chicken and casserole or skillet chicken with vegetables.

For a fricassee, prepare the bird as for frying, season, and coat well with flour by moistening each piece with water or milk before flouring. About the same amount of fat should be used in the frying pan as for fried chicken. The pieces of chicken are browned well on all sides, turned frequently for even browning. The excess fat is then drained off or the pieces are transferred to a covered roaster. A small amount of water or giblet stock is added, about one-half cup at first, more as needed. The pan is covered closely and the chicken simmered, not boiled, in the frying pan on top of the range, or in a covered roaster in a 300° F. oven until tender. This usually takes two to three hours, depending upon the age of the bird. It may take even longer.

For a casserole of fowl with vegetables, the bird is prepared and browned as for fricassee.

Serve Gravy Piping Hot

Poultry and Egg National Board

The browned pieces then are transferred to a casserole. For a four-pound stewing chicken, chop 3 or 4 carrots, 3 or 4 pieces celery, 1 medium-sized onion, and a green pepper. Partly cook the vegetables in the fat in the frying pan. Then transfer them to the casserole with the chicken and add about a cup of hot water or chicken stock (from cooked giblets). Cover closely and cook in the oven at 300° F. until tender, about three hours. When done, remove the pieces of chicken and drain off the liquid. Thicken the liquid, add the vegetables, test for seasoning, pour the vegetable sauce over the chicken and serve from the casserole.

There are endless variations of braising methods for poultry, especially of casserole dishes. Many different vegetables may be used. Corn is always a favorite with chicken. Rice also may be used. Look up recipes in a cookbook for additional suggestions.

In all braising, degree of doneness is determined by tenderness, which is tested with a fork. It is well, however, to do as little piercing with a fork as possible, since this lets out juices. But with braising the lost juices are retained in the gravy, and gravy is an essential part of any braised-meat dish.

Stewing. Old birds need long, slow cooking in water to cover, to soften the large amount of tough connective tissue. Birds cooked by this method lose flavor and food value to the stock, but these are saved when the stock is made into a gravy or sauce and served with the meat, as in creamed chicken, chicken pie, or turkey à la king. Old birds may be stewed whole or in pieces.

For stewing whole, which is the simplest way when the meat is to be removed from the bone, draw and groom an old bird as for roasting. Barely cover with water, hot or cold. Add salt, pepper, and a few seasoning vegetables such as an onion, a carrot, and a piece of celery, and two or three whole cloves and peppercorns. Cover the kettle and simmer, never boil, until the meat is tender, two to four hours or longer depending upon the age and kind of bird. An old rooster or an old Tom turkey will take the longest time. It is done when a fork can be inserted easily to the bone in the thickest part of the thigh.

Any meat cooked in liquid is juicier if allowed to cool and chill in the broth than if served at once. If possible, therefore, stew a bird the day before it is needed and let it stand in the broth, breast down, overnight—in the refrigerator, if possible. If storage space does not permit this, let the bird cool in the broth for an hour or so, in a cool place.

A timesaver in stewing old birds is the pressure saucepan, which is available in various sizes. In using a pressure pan for stewing chicken or other poultry, follow the directions furnished by the manufacturer.

The stewed chicken or other poultry is ready to be made into many attractive dishes. When stewed in pieces, it may be served as chicken and dumplings. The dumplings are added to the stewed chicken (see pages 271 and 274), being kept on top of the broth, and the kettle is covered tightly for 20 minutes until the dumplings are cooked. Then the broth may be drained off, thickened for gravy, and served over the chicken and dumplings.

The meat may be removed from the bones and used for either creamed or à-la-king dishes, shortcake, poultry pie, scalloped dishes, salad, sandwiches, croquettes, timbales, loaves, soufflé, chop suey, and pressed chicken or turkey. When stewed chicken is used for chicken salad, the broth may be used as soup, aspic (molded), or in various sauces for casserole dishes.

Creamed chicken may be prepared by combining equal measures of diced cooked chicken and medium cream sauce made from the chicken broth, to which some whole milk or cream is added. Use 2 tablespoons flour and blend with 2 tablespoons chicken fat, butter, or margarine to each cup liquid. Use chicken broth for at least $\frac{1}{2}$ to $\frac{3}{4}$ of the liquid. Season with salt, pepper, paprika, tabasco sauce, and grated onion. Cook the onion in the fat before blending the fat with the flour. Chopped celery, green pepper, and pimiento also may be added, the celery and green pepper being cooked in the fat with the onion. Do not brown the vegetables.

Creamed chicken is served hot in pastry shells or timbale cases, on waffles or crisp toast, or in toasted bread cups. It may be served also in a rice or noodle ring. Other ways to serve creamed chicken are chicken shortcake, chicken pie with a pastry, biscuit or mashed-potato top, or scalloped chicken and spaghetti.

There are many other variations of creamed chicken and turkey. The à-la-king dishes are well-known and are favorites with many people. Chicken à la king is a rich creamed chicken to which egg, mushrooms, green pepper, and pimiento are added. Usually only the yolk of the egg is used and the slightly beaten yolks are added to the cream sauce, care being taken not to overcook the sauce after the yolks are added. The mushrooms and green pepper are cooked with the onion in part of the fat.

When creamed chicken and chicken à la king are seasoned with curry, they become curried chicken.

Chicken salad is prepared by chilling and marinating (see page 168) cooked, diced chicken in a well-seasoned dressing. Then the chilled chicken is combined with an equal measure of chilled crisp materials such as diced celery, cucumbers, chopped onion, green pepper, and perhaps some fruit, such as diced pineapple, or seeded white or red grapes. Proportions for a delicious chicken salad are two parts chicken to one part celery and one part pineapple or white grapes or cucumber, with a little grated onion and a well-seasoned dressing.

Cookbooks may be consulted for further variations of the dishes made from stewed chicken, turkey, and other poultry.

Cooking Smoked Turkey. Smoked poultry was mentioned earlier in this chapter. Smoked turkey is excellent roasted, simmered in water (stewed), or sliced and fried.

To prepare a home-smoked young turkey for roasting wash it thoroughly inside and out and soak it several hours or overnight in enough cold water to cover. Then prepare it for the roasting pan in exactly the same way as a fresh turkey, except that in making the stuffing the salt should be omitted. Roast in the same way as a fresh turkey at 250° to 300° F. for about four hours.

An old bird should be simmered in water to cover, either whole or in pieces, until tender and then cooled in the broth.

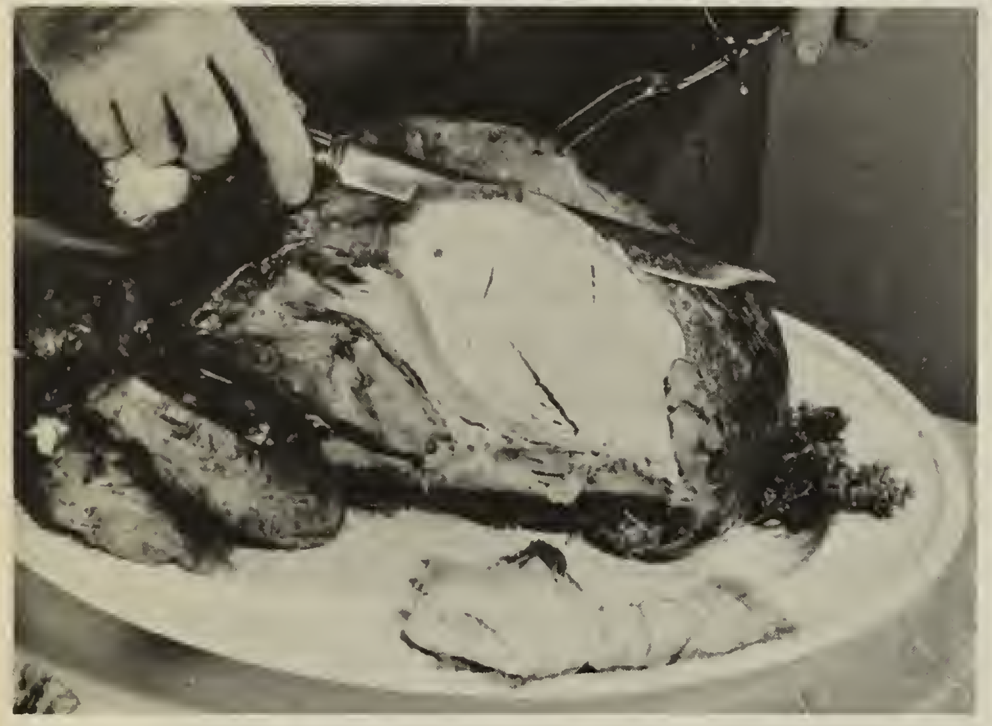
Serve roast or simmered smoked turkey in very thin slices, either hot or cold.

The breast meat of large young smoked turkeys may be sliced across the grain in half-inch slices, floured, and fried slowly. These smoked turkey steaks are best when served hot.

Left-over cooked smoked turkey may be used in the same ways as left-over ham. Even small amounts of it add excellent flavor to many creamed and casserole dishes, noodles, macaroni, potato cakes, stuffed peppers, croquettes, timbales, loaves, and sandwiches.

Carving Poultry. As with any other meat, proper cooking, serving, and good carving utensils are essential to a good carving job. (See page 213.) The standard carving set may be used, although a steak set is especially good for carving small birds. Unless the platter is very large, an extra plate is always needed.

The bird should be placed on its back on the platter. It may be steadied with a wedge of bread or apple under each side, if the carver feels this is necessary. Paper frills on the ends of the drumsticks are useful in handling



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Carving Poultry · (*Upper left*) Place bird on back, with legs toward the carver's right. First remove one leg. (*Upper right*) Remove the wing from the same side. (*Lower left*) Slice the breast evenly

the bird during carving. It is placed on the table with the legs either toward the carver or to the carver's right, if the carver is right-handed.

Regardless of the bird to be carved, first remove one leg. Hold the drumstick firmly with the thumb and forefinger. Cut through the skin cleanly between the leg and the body and with a slight twist on the end of the drumstick, the leg of a turkey, chicken, or guinea fowl will separate easily if the bird has been properly cooked. The leg of a duck or goose does not separate quite so easily. Then cut the remaining skin between the leg and the back. On a turkey, try to remove the "oyster" (the choice bit of dark meat in a spoon-shaped bone on the back) with the leg. Place the leg on the extra plate. Disjoint the thigh and drumstick of a large bird by holding the leg at right angles to the plate. Then slice the leg meat by cutting down, turning the leg to make uniform slices. Slice the thigh meat by straddling the bone with the fork and cutting the meat in lengthwise strips.

Now remove the wing from the same side by placing the knife at right angles to the breast, about three-fourths to one and one-half inches (depending on size of bird) above the wing, and cutting at an angle down through the skin and the wing joint. Remove the wing to the extra plate, and in a large bird, separate the wing at the "elbow" joint.

To slice the breast of a turkey, chicken, or guinea fowl, straddle the ridge of the breastbone with the fork or insert the fork in the rib section on the side opposite the one being carved. Holding the knife parallel to the breast and using a sawing motion, begin slicing just above the place where the wing was removed. Try to keep the left hand perfectly still, thus holding the bird firmly on the platter, while the slicing hand makes slices about one-fourth to three-eighths inch thick.

The breast of a duck or a goose is too shallow to carve in the same way as a turkey or chicken. One method is to run the point of the knife under the breast flesh to loosen it from the breastbone, and then cut it into pieces about one and one-half to three inches wide across the grain of the meat and at right angles to the ridge of the breast. Then lift these pieces off the bone. Another way is to cut the breast in long thin slices with the grain and parallel to the ridge, then run the knife under them and lift them off the bone.

After carving the first piece of breast meat, the carver should begin to serve the plates. First, a spoonful of stuffing is placed on the plate. This is topped by a slice of dark and a slice of white meat. Each side of a 15-pound turkey will yield about 10 pieces of dark meat, 12 slices of white meat, and a wing. Do not be discouraged with what seems to the carver slow and awkward carving. Carving skill comes only with advance study of just what to do, then long practice, always with a very sharp knife. Do not hesitate to stand up to carve, for it is perfectly good form; and make use of every opportunity for practice. Good carving is an accomplishment greatly to be desired.

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XVII · Fish and Fish Cookery

The oceans that border our shores, and our inland lakes and waterways, make their contribution to the food supplies of the country in the form of fish. While fish are planted in small lakes and fresh-water streams, and oyster beds are seeded and cultivated, in general this food crop is to be had for the catching. Yet the figures on fish consumption indicate that far too little use is being made of this valuable food.

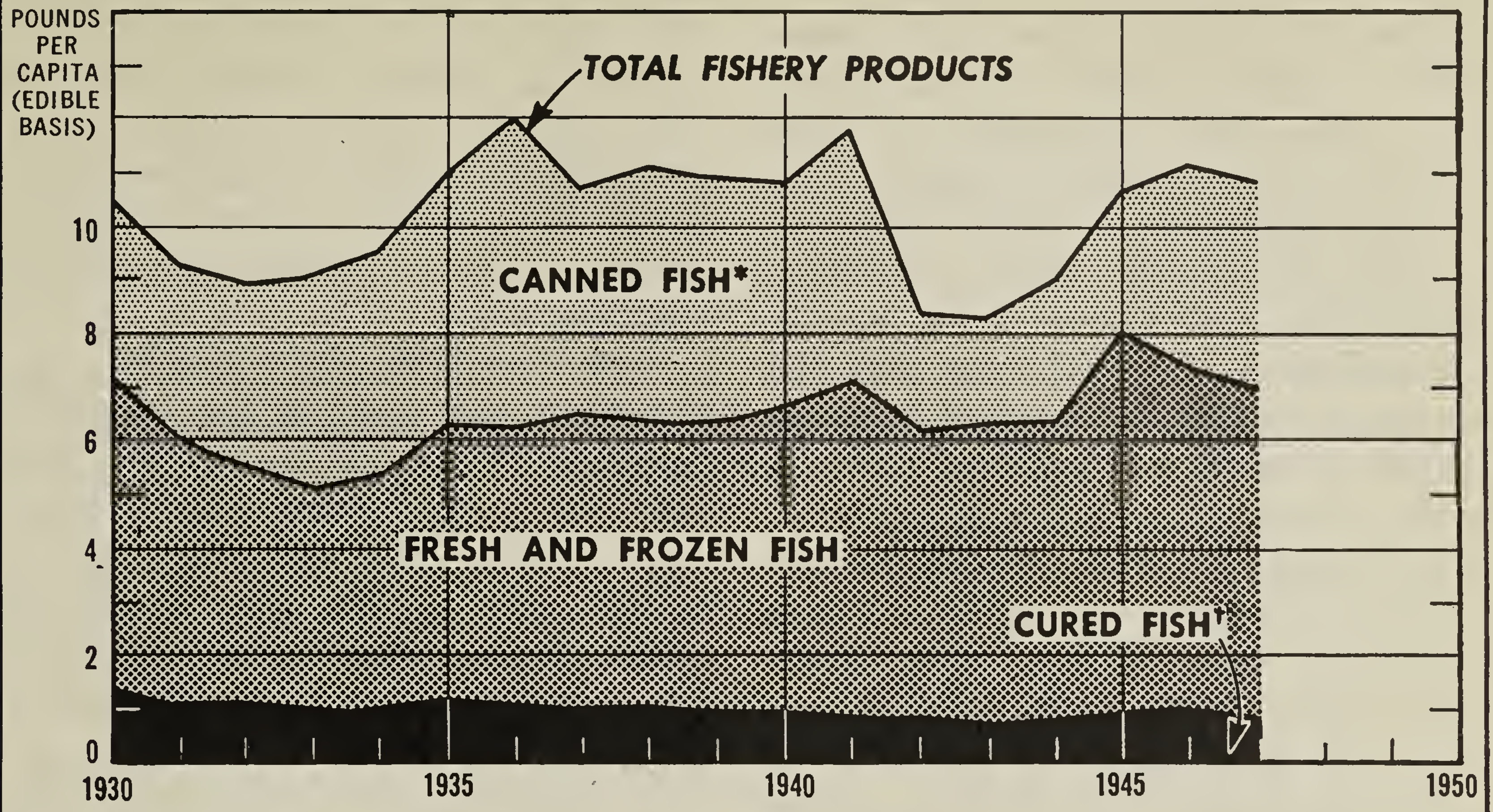
Beginning in colonial days, there has gradually been built a fishing industry that is responsible for catching and distributing this food from sea and fresh-water sources, an industry estimated in 1943 to be worth some six billion dollars. Our estimated annual prewar catch of four to five billion pounds of fish ranked second only to Japan's prewar catch. During the war years fish production ran somewhat lower than in prewar years, but was maintained at a relatively high level through the recruitment of persons not previously engaged in the fishing industry, longer hours of work, and the intensive use of available production facilities. By 1948 fish production was slightly above prewar levels.

Some two thirds of the catch is marketed as human food, and one third goes into industrial uses. The portion used for human consumption was almost equally divided between canned fish and fresh and frozen fish. Only a relatively small amount of cured fish is produced. (See page 243.) In 1947–1948 the salmon pack was still below that of the prewar years. This was somewhat compensated for by a record pack of tuna. The catch of the California pilchard (sardine) remained low. On the other hand, the 1948 pack of the Maine sardine was the largest in history.

THE FISHING INDUSTRY

Fish are very perishable and deteriorate rapidly after removal from water. Distribution of fresh fish was limited, in early days, to areas near the water. Supplies of most fish were seasonal. To meet this situation this industry has developed methods of preservation which make it possible to store fish for out-of-season use and to ship them long distances, thus widening their market. Now this industry ships fish, fresh, frozen, canned, salted, and dried, to all parts of the country, and exports canned and dried fish to many other countries.

Dried and Salt Fish. Drying and salting were first developed on a local scale, especially in the New England areas, adjacent to the waters in which the cod abound. The New Englanders early developed salt cod for their own use. As trade developed with the West Indies, they exchanged the dried fish for sugar and molasses. In this way, they used a local product as cargo when their ships went out to bring back needed supplies from the tropics. It is surprising to find that even now the inhabitants of those sea-bathed islands of the West Indies use dried and salted fish from other waters. But New England did not ship it all. Codfish signs still dot the New England landscape and salt cod, creamed or in balls, is a traditional Sunday-morning breakfast in many New England homes.



*Excludes canned food products containing small quantities of fish; for example, clam chowder, clam broth, and codfish-cake material.

†Excludes partially processed products which may subsequently be reported as a final product, either as canned or cured fish.

U.S.D.A.

Civilian Per Capita Consumption of Commercial Fishery Products, United States, 1930–1947 · Includes fin fish and shellfish landed by commercial fishermen; excludes game and sports fish caught by individuals

Canned Fish. As canning developed, it too was used to put the abundant fish supplies of one area at the service of another. Again New England took leadership, canning the clams abundant in New England waters. Canned oysters carried the distinctive flavor of that shellfish from the South Atlantic coast to the inland areas of the rural South. While a far cry from the fresh variety, the canned product helped to get local surpluses to other areas in a safe and acceptable form at a time when fresh oysters were only known at places close to the coast.

Salmon, both a seasonal and a local fish, is now available in canned form at all seasons, the country over. Canning not only has supplied a means of marketing a surplus crop, but also has provided a nutritious and reasonably priced food in widely separated areas.

Frozen Fish. The developments in refrigeration and rapid transportation have had quick application in the fishing industry. By keeping fish frozen for delivery in fresh form, refrigeration extended the area of distribution and lengthened the season and the distances fish could be shipped. A well-known method of quick freezing came as the result of experimental studies to minimize texture changes in freezing fish. Now frozen fish fillets of good quality are distributed almost nationwide from the east coast. Yet, despite all this, our fish consumption is still low.

SOURCE OF SUPPLY

Most of our fish come from the salt water. Still, the Great Lakes and inland waterways make their contributions not only to local, but also to national supplies.

The Pacific Coast. The Pacific area does not ship large amounts of fish, in fresh or frozen forms, both because of the types of fish available in the Pacific-coast area, and because of the long haul involved in getting the fish to heavily populated areas of the interior. It now runs far ahead in production of canned fish, owing to the abundant supplies of three popular canning fish—the salmon, tuna, and pilchard, or sardine—in the waters of the Pacific. In cans, these fish are distributed to consumers the country over, carrying a valuable food at different qualities and costs.

The East Coast. There are differences in fish production up and down the east coast. New England leads in the total production. The fish populations are larger there. New England also leads in the amount of fish distributed in fresh and frozen form. This is due, in part, to the nearness to large centers of population, and in part to the popularity of the fish caught there. New England frozen fish are sent as far west as St. Louis and Minneapolis.

Atlantic and Gulf Coast. The South Atlantic and Gulf coasts come next in pounds produced, contributing their special varieties, in fresh, frozen, and canned forms. Although the menhaden leads in the amount caught (in 1940 almost half the catch was menhaden), most of this fish goes into the production of oil and meal. Some is used fresh and some is canned. Large quantities of shrimp are canned along the Gulf coast, and other varieties of fish are canned in large quantities along the South Atlantic from North Carolina to Florida. Next in order in pounds of production is the Middle Atlantic region, including the Chesapeake Bay area. These last two areas are near centers of population and ship to neighboring markets their fish, fresh and frozen. In addition they supply large quantities of frozen oysters and crab meat to the Middle West. What the market does not absorb in fresh or frozen form is canned for wide distribution.

Fresh-Water Fish. The Middle West supplies the largest catch of fresh-water fish reaching the commercial market. The Great Lakes and rivers tributary to the Mississippi probably yield the major part of the 140 million pounds of fresh-water fish reaching the market each year. In addition, a large poundage is taken each year by sportsmen and individuals for family use; some of this may reach local markets. The amount of fish so caught would be difficult to estimate.

KINDS OF FISH

Fin Fish. While there are thousands of varieties of fish, the kinds most in demand are limited. There are probably not more than a hundred of these used in the country as a whole, and out of this number there is a heavy production of only a few kinds in the different fishing areas. This is due in part to the development of processing facilities to handle certain types of fish, such as the salmon of the northwest, and the tuna of the California coast, and also in part to the fact that consumer demand is largely limited to a relatively few kinds of fish. Consumers lack knowledge of new varieties and are unwilling to try unfamiliar varieties.

Carson (see bibliography) pointed out that in New England, which has a yearly catch of over 600 million pounds, 85 per cent of the total poundage comes from 10 species. The remaining some 70 species taken from New England waters comprises only 15 per cent of the total catch. In 1940, haddock came first in the amount produced. Rosefish and cod were poor seconds to haddock. In 1946 more rosefish were produced then any other kind. Herring, whiting, flounder, pollock, and mackerel followed in a third group. The shellfish clams and oysters complete the list of the top ten. Similar conditions prevail in other areas. Add to the list above the pompano and red snapper from the Gulf and the South Atlantic, halibut and salmon from the West coast, and shad that wander up the rivers of the East coast during the spring months, and you have the varieties best known and most in demand among the fin fish coming from salt waters.

Other varieties listed in Table XLV are abundant and could be made available in many markets at low prices. But the demand is for a few well-known kinds, and many good varieties are neglected because consumers are unfamiliar with them.

The best-known of the fresh-water fish are the white fish and lake trout from the Great Lakes, smelts from the lakes or the Michigan streams, and the catfish, perches, crappie, and sunfish from the rivers.

Shellfish. Fish with shells as distinguished from fish with bones form two groups based on differences in the character of the shells. Oysters, clams, and scallops live in hinged shells. They have soft unsegmented bodies, and the whole body portion is eaten except in the case of scallops. In scallops only the muscle is used.

Lobsters, crabs, and shrimp have a crustlike shell conforming to the shape of the body and the various appendages.

Oysters are among the most valuable aquatic crops. The total crop ranks second only to salmon and tuna in the income it returns to the industry. Oyster-farming is highly developed. Not only are the beds seeded but the oysters may be transplanted to provide better growing conditions, and the collections have had economic guidance.

Oysters are most abundant in East coast waters. The Chesapeake Bay area leads in their production. They are shipped in the shell, or fresh-shucked, to near-by areas. Frozen oysters are distributed the country over. Since oysters are often eaten raw, the beds must be protected from pollution, and are Federally inspected as a safeguard against contamination. Oysters are graded according to size as standards, selects, and counts. In some markets, certain sources are preferred.

The Pacific coast produces few oysters. The olympian oysters are small in size and of good flavor. Japanese oysters now being produced there are very large. Oysters are in season from September to April. Summer is the spawning season, and the flavor is less good at that time than in the cooler months.

Lobsters come largely from New England fisheries. Practically all the domestic catch is used fresh or frozen. The claw meat is preferred and brings a higher price than the tail meat. Lobster is a popular shellfish. This popularity, combined with uneconomic methods of collection, is rapidly decreasing the supply and, as most consumers of lobster know, increasing the price.

While the total yearly poundage has decreased, lobster still is responsible for about one tenth of the income of the New England fish industry. It is already a luxury food, and supplies will decrease further unless something is done to control the catch so that the young lobsters will not be taken before the age for spawning.

Crabs come in largest amounts from the Chesapeake Bay area, but the South Atlantic and Gulf areas also contribute to the national supplies of this popular shellfish. Other areas provide fresh crab meat for local use. Crabs are sold as "soft-shelled crab" just after molting. These come on the market in early summer. They must be shipped alive; consequently their distribution is limited to

TABLE XLV · *Proximate Composition of Edible Portions of Some Typical Fin Fish*

Species	Total Solids	Fat	Protein (N × 6.25)	Ash (Inorganic Matter)	Fuel Value per Pound
Fresh	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Calories*
Alewife	25.6	4.9	19.4	1.5	570
Bass, black	23.3	1.7	20.6	1.2	455
Bass, red	18.4	.5	16.9	1.2	335
Bass, sea	20.7	.5	19.8	1.4	390
Bass, striped	22.3	2.8	18.6	1.2	465
Bluefish	21.5	1.2	19.4	1.3	410
Butterfish	30.0	11.0	18.0	1.2	800
Catfish	35.9	20.6	14.4	.9	1,135
Cod	17.4	.4	16.5	1.2	325
Eels, salt-water	28.4	9.1	18.6	1.0	730
Flounder	15.8	.6	14.2	1.3	290
Haddock	18.3	.3	17.2	1.2	335
Halibut	24.6	5.2	18.6	1.0	565
Herring	27.5	7.1	19.5	1.5	660
Mackerel	26.6	7.1	18.7	1.2	645
Perch, white	24.3	4.0	19.3	1.2	530
Perch, yellow	20.7	.8	18.7	1.2	380
Pickerel, pike	20.2	.5	18.7	1.1	370
Pompano	27.2	7.5	18.8	1.0	665
Red snapper	21.5	1.0	19.7	1.3	410
Salmon, Atlantic	35.4	12.8	22.0	1.4	950
Salmon (Atlantic), landlocked, spent	22.3	3.3	17.8	1.2	470
Salmon, chinook, California	36.4	17.8	17.8	1.1	1,080
Shad	29.4	9.5	18.8	1.3	750
Smelt	20.8	1.8	17.6	1.7	405
Spanish mackerel	31.9	9.4	21.5	1.5	795
Trout, brook	22.2	2.1	19.2	1.2	445
Trout, salmon, Atlantic	29.2	10.3	17.8	1.2	765
Whitefish	30.2	6.5	22.9	1.6	700
Whale meat (mammal)	28.8	4.2	23.1	1.2	607
Canned					
Mackerel	31.82	8.68	19.63	1.30	731
Salmon, chinook (Atwater, 1888)	38.12	15.70	20.18	1.32	1,037
Salmon (Shostrom, Clough, and Clark, 1924):					
Sockeye	35.22	11.22	20.80	1.23	860
Chinook	36.83	15.72	17.67	1.21	991
Coho	32.51	8.49	21.08	1.24	750
Pink	30.20	6.99	21.40	.76	696
Chum	29.96	6.69	20.67	1.02	524
Steelhead trout	33.16	8.95	21.32	1.21	792
Atlantic salmon	35.70	12.49	21.14	1.22	920
Sardines in oil (French)	43.63	12.71	24.87	5.61[1]	999
Sardines in oil (American)	47.85	25.52	19.17	3.84[1]	1,433
Sardines in tomato sauce (American)	32.33	5.55	18.08	3.94[1]	570
Tuna in oil	46.40	19.60	25.40	1.40	1,298
Salted and dried					
Boneless salt cod	45.6	0.3	26.3	23.2[1]	502
Desiccated cod	88.4	4.9	72.0	5.2	1,546
Smoked haddock	27.4	.2	23.3	1.5	442
Smoked halibut	50.6	15.0	20.8	2.1	1,020
Pickled herring	57.7[2]	19.7	25.0	4.0	1,297
Smoked herring	65.5	15.8	36.9	1.5	1,353
Salt mackerel	56.1	25.1	18.6	2.6	1,405

[1] Salt included.

[2] Contains 4.04 per cent of undetermined acids, sugar, etc.

TABLE XLVI · *Proximate Composition of Typical Shellfish*[1]

Name	Total Solids	Fat	Protein (N × 6.25)	Ash (Inorganic Matter)	Carbohydrates	Fuel Value per Pound
Fresh	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Calories*
Abalone	27.2	0.1	21.7	1.3	3.3	469
Long clams	20.6	1.7	13.6	2.5	2.8	377
Round clams	19.2	1.1	10.6	2.3	5.2	340
Crab (Eastern, hard)	22.9	2.0	16.6	3.3	1.2	415
Lobster	20.8	1.8	16.4	2.2	.4	388
Mussels	15.8	1.1	8.7	1.9	4.1	285
Oysters (Eastern)	13.1	1.2	6.2	2.0	3.7	235
Scallops	19.7	.1	14.8	1.4	3.4	343
Shrimps	22.7	.4	19.3	1.5	1.7	407
Canned and dried						
Long clams (canned)	15.5	1.3	9.0	2.3	2.9	276
Round clams (canned)	17.1	.8	10.5	1.0	3.0	285
Crab (Eastern, hard, canned)	20.0	1.5	15.8	1.9	.8	372
Lobster (canned)	22.2	1.1	18.1	2.5	.5	392
Oysters (canned)	16.6	2.4	8.8	1.5	3.9	337
Shrimp (canned, dry-pack)	32.3	.8	25.5	2.9	—[2]	508
Shrimp (canned, wet-pack)	24.3	.5	20.0	1.9	—[2]	393
Dried shrimp	87.5	5.0	71.4	6.8	—[2]	1,540

near-by areas. While some hard-shelled crabs are shipped alive, the larger portion of the catch is sold as crab meat, fresh, frozen, or canned.

Clams are used in much smaller amounts than the other shellfish mentioned. The soft, long-necked clams prevail from Cape Cod north, and the hard or little-neck clams south of Cape Cod along the coast to Texas. Soft-shell clams live in the tidal sand, while the hard-shell varieties live from the tide lines into fairly deep water. The production is not large, about 30,000,000 pounds a year. The whole fish is shipped fresh, unshucked, to near-by areas, and clams are canned, chopped for use in chowder, and as clam juice, so that they can be distributed widely.

Scallops are available in limited amounts. Only the large muscle that opens and closes the shell is used, and the remainder of the fish is discarded. Scallops are available fresh or frozen. They are sweet owing to the presence of large amounts of glycogen.

Shrimps are produced from the Carolinas south and along the Gulf coast. They are distributed in the shell, fresh or green, and cooked with the shell whole or split to remove the sand vein.

COMPOSITION AND NUTRITIVE VALUE

Fish is a valuable protein food. It has approximately the same percentage of protein as lean meat, and the protein is of good quality. (See Table XLV.) The fat content is low. All the shellfish and many fish with bones contain less than 2 per cent fat. Among these are cod, haddock, smelts, bass, perch, and flounder. Among the fat fish, those containing more than 5 per cent fat, are salmon, shad, herring, mackerel, butterfish, and catfish. As a group, "fish as caught" are not good sources of energy, but since fat is

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[1] Tables XLV, XLVI, and XLVIII have been adapted from tables in *Nutritive Value of Fish and Shellfish*, Document No. 1000, Bureau of Fisheries, Washington, D.C., 1926.

[2] Carbohydrates present but undetermined.

Table XLVII · Forms of Fish in Three Principal Markets[1]

Species	Weight (Pounds)	Principal Form in Which Received	Season When Available
Boston			
Cod	1½–25	Dressed, heads off, fillets, fresh and frozen	All year
Haddock	1½–2½	Dressed, heads on, fillets, fresh and frozen	All year
Hake	1½–6	Dressed, heads off, fillets, fresh and frozen	All year
Halibut	7–125	Dressed, heads off, and steaks	Fresh: available March to December Frozen: during December to March
Mackerel	1–3	Round, fillets, fresh and frozen	Fresh: available June to November Frozen: during November to June
Pollock	1½–4+	Dressed, heads off, fillets, fresh and frozen	All year
Rosefish	¾	Fillets, fresh and frozen	All year
Chicago[2]			
Bullheads	⅓–¾	Skinned, headless, and dressed	All year
Carp	2–8	Round, fillets	All year
Lake herring	⅕–½	Heads on, dressed, fillets	Practically all year, although heaviest catch is in spring and fall
Yellow perch	¼–¾	Round, fillets	April to December
Pike	½–6	Round, dressed, heads on, and fillets	Fresh during spring and fall. Winter-caught is frozen
Suckers	1–6	Heads on, dressed, and fillets	All year
Lake trout	2–8+	Heads on, dressed	All year, although mostly frozen stock is sold during winter months
Whitefish	1½–4+	Heads on, dressed	All year, although mostly frozen stock is sold during winter months
Seattle			
Flounders	½–2	Heads on, fresh	All year
Halibut	5–80	Dressed, heads off	Fresh: available March to December. Frozen: all year
Ling cod	3	Dressed, heads off, and filleted	March to December
Sable or black cod	5	Dressed, heads off	May to December
Salmon		Dressed, heads off	Fresh: available May to December
Chinook or king	5–30		
Chum or keta	5–10		Frozen: all year
Pink	3–5		
Silver	5–12		
Smelts	⅛–1	Round, fresh	All year
Soles	½–3	Heads on, fresh	All year

added in preparation, "fish as served" compare favorably with meat dishes in energy content. They are good sources of the minerals calcium, phosphorus, and iron. The sea varieties are among the best food sources of iodine. All contain trace minerals. Any fish canned with bone is a rich source of calcium. A small dried fish, charalis, much used by low-income families in Mexico, is a rich source of this important mineral.

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[1] *Fish and Fishery Products.* War Department Technical Bulletin, Quartermaster's Corps, December 31, 1944.

[2] Only fresh-water varieties are listed. Chicago markets also handle fish from Atlantic, Gulf, and Pacific coasts.

Fish are good sources of the B vitamins. The high-fat fish and the livers of all fish are rich sources of vitamins A and D, some much richer than others. Fish is easily digested and well absorbed. Notwithstanding the high nutritive value of fish, the yearly per capita consumption for the country as a whole averaged only about thirteen pounds during the prewar years 1935–1939. In 1946 the per capita consumption was not quite eleven pounds. (See chart, page 243.) This lower consumption was due in part to the lower supplies that year, particularly of canned salmon. The per capita fish consumption in pounds in 1946 was distributed as follows:

Fresh fin fish	5.2
Fresh shellfish	1.0
Canned fish	4.1
Salted and smoked fish	.6
	10.9

The low consumption of fish in this country results from the lack of readily available supplies the country over. Even the fresh-water varieties have not been accessible to those living in many inland sections of this large country. While modern industry has learned how to freeze and ship fresh frozen fish from the seacoast areas and inland waters to all parts of the country, there are still many areas that get small supplies and little variety. As a result many people do not know fish. We eat what we have been accustomed to eating. Fish consumption is highest in the areas close to production, not only because of the greater accessibility of fish in those areas, but also because the habit of eating fish has been built up there over the years. Even in fishing areas there is hesitancy about trying a new variety. If our fish resources are to be used economically, an educational job needs to be done.

Table XLVII shows the leading fresh fish in three representative markets, their average weight, the principal forms in which marketed, and the season when available.

SELECTION AND CARE

On the market, the different varieties are present in different forms. Guides to selection vary with fin fish and shellfish.

Fin Fish. Fin fish, or fish with bones, are sold fresh and fresh-frozen. **Fresh unfrozen fish** is limited in distribution to season and area of supply. The flesh of a fresh fish should be firm and elastic. Any scales cling to the skin and have a characteristic sheen.

These points should be noted in selecting fresh fin fish. The gills should be reddish in color, not gray or brown. The eyes should be bright and full, not sunken. There should be no disagreeable odor.

Frozen fish is comparable to fresh when frozen by modern methods soon after removal from the water, and held hard frozen. Both fresh and frozen fish are marketed in the following forms:

Whole or round fish are in the form in which they come from the water. Fish marketed in this form are those that keep better without dressing, and small fish. The dealer will remove the scales, draw the fish, and remove the head and fins if requested.

Drawn fish are those with only the viscera removed. Some fish keep better when this is done before either refrigeration or freezing.

Dressed fish have been drawn, and any scales and the head removed. The tail and fins may be removed. Large dressed fish may be sold in pieces.

Steaks are slices cut across a large fish. They may contain some bone but never much. **Fillets** are portions stripped lengthwise of the fish. They contain no bone or other waste.

In evaluating the cost per pound it is important to know the amount of edible meat. While fillets and steaks contain little or no waste, there may be considerable waste when fish is bought whole, drawn or dressed. Table XLVIII indicates the percentage of the edible portion of some typical fish purchased in different forms.

TABLE XLVIII · *Percentage of Edible Portions of Fish as Commonly Purchased*

Product	Percentage Edible
Whole fish:	
Butterfish	55.9
Brook trout	47.0
Herring	51.1
Mackerel	45.8
Pickerel	53.1
Pompano	56.2
Shad	52.4
Smelt	61.8
Striped bass	49.6
Whitefish	45.7
Fish with entrails removed:	
Flounder	41.3
Lake trout	63.6
Mackerel	57.4
Pickerel	55.7
Red snapper	54.3
Fully dressed fish:	
Albacore	91.3
Barracuda	75.0
Cod	64.6
Eel	76.1
Halibut	75.9
Mackerel, California	64.9
Rock cod ("chili pepper")	71.7
Sablefish (black cod)	72.2
Salmon, chinook	88.7
Sea bass	74.0
Skipjack	90.1
Sturgeon	84.7
Striped bass	73.9
Yellowtail	80.8

Shellfish. In buying shellfish the consumer needs to look for special points for the different kinds. *Clams* and *oysters* may be bought alive in the shells or shucked. The latter may be refrigerated or frozen. Tightly closed shells indicate the fish are still alive.

Crab and **lobster** may be bought alive, whole-cooked, or as cooked meat. The meat may be refrigerated or frozen.

Uncooked or **green shrimp** are never sold alive. Heads are removed on the boats and the fish are refrigerated or frozen. Cooked shrimp is sold with the heads removed, either with or without the shell, and with or without the sand vein.

Canned Fish. Many kinds of fin fish are available canned. The most used are salmon, tuna, and sardines. These may be used as they come from the can, or as components of made dishes. Lobster, crab, and shrimp meat are available canned, and oysters and clam products are canned in limited amounts.

Salted, smoked, and **dried** fish are available from both domestic production and import, the latter largely from the Scandinavian countries. Salt cod, pickled herring, and smoked haddock are among the most familiar. Increasing amounts of smoked salmon are being produced in this country.

HOME CARE

Bear in mind that fish is a perishable food. Fresh-caught fish should be dressed as soon as possible after removal from the water and refrigerated until used. When any period of time is to elapse before cooking, the fish should be frozen. This may be required with a large catch.

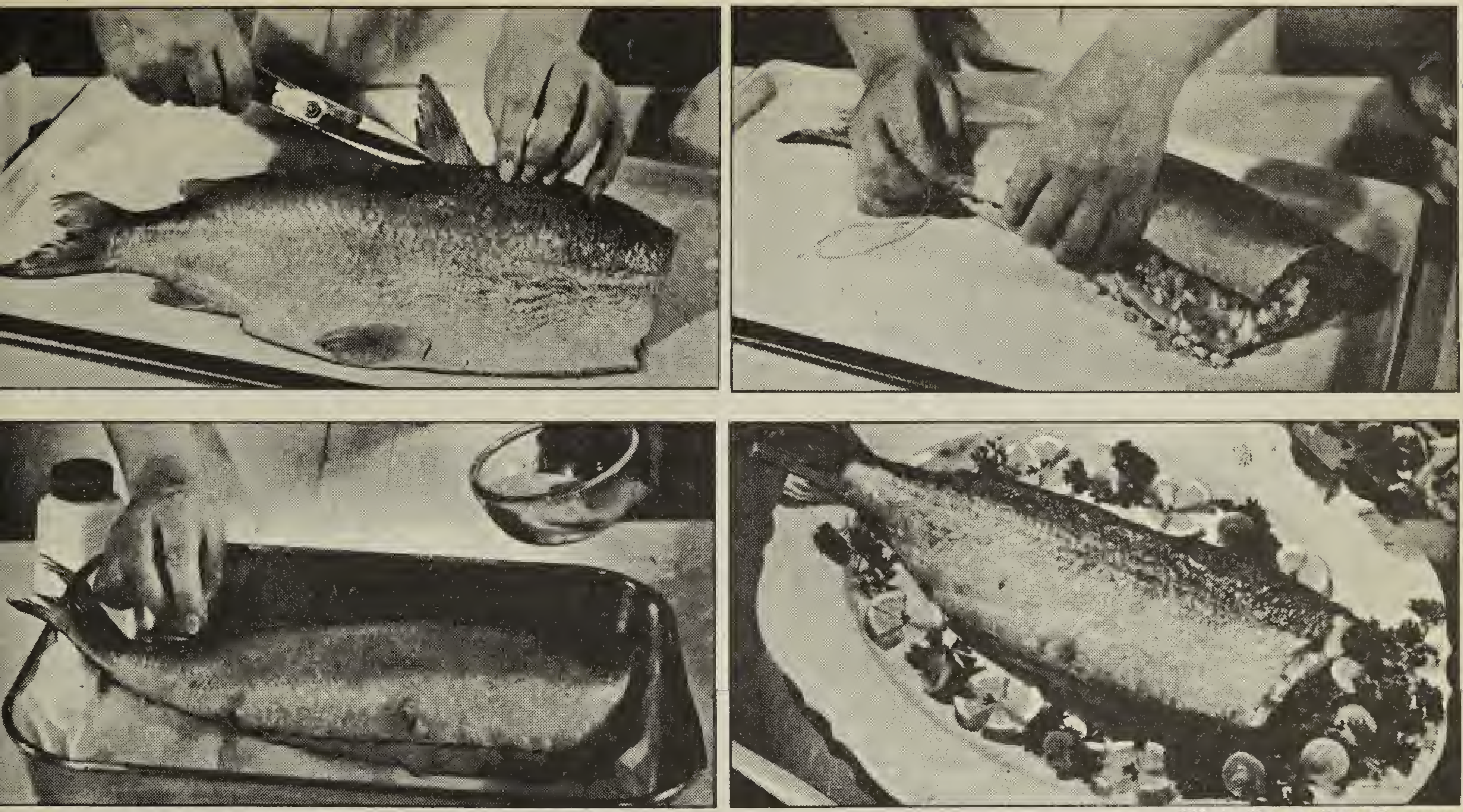
Fresh fish from the market should be wrapped closely in oiled paper, and placed in the coldest portion of the refrigerator. Do not remove until ready to cook.

Frozen fish should be held frozen until used. Thaw immediately before cooking or in cooking. This last method is preferred but increases the cooking time slightly.

Shucked and **cooked shellfish** should be held in tight containers frozen or at low temperatures.

COOKING METHODS FOR FIN FISH

Fish is always tender, as it contains little connective tissue and that present is in a form easily softened. It requires only a short cooking time. Because of the flaky texture that results when fish is cooked, it requires careful handling to avoid breaking.



What's New in Home Economics

Baking Fish · (*Upper left*) Wipe fish with damp cloth. Remove fins if desired. (*Upper right*) Stuff fish about two-thirds full and sew up the opening. (*Lower left*) Wipe the outside with oil or fat. (*Lower right*) Baked fish ready to serve

The object in cooking fish is just to coagulate the protein, soften any connective tissue, and retain and develop flavor. This should be done in the shortest possible time to avoid loss of moisture, flavor, and overcooking the protein. The addition of fat during cooking, or a sauce containing fat in serving, increases the richness of fish low in fat.

Broiling. Broiling can be used satisfactorily for whole fish, if not too thick, and for split fish, boned fish, and fish steak or fillets.

Preheat the broiler about ten minutes. Remove the rack from the broiler pan or use a separate pan. Place the fish in lightly greased hot pan. Whole, small fish should be turned once. Split fish, steaks, and fillets are better cooked without turning, though they may be turned. In case the split fish is not to be turned, begin with the skin side down; if to be turned, begin with the skin side up and cook 5 minutes before turning. Wipe the exposed side with melted fat or French dressing.

Place whole fish and steak more than one inch in thickness six inches from the source of heat. Split fish, steaks less than one inch, and fillets are placed three to five inches from the heat, depending upon the thickness of the piece. Broil until brown, basting two or three times, with fat containing seasonings. The cooking time will range from five to ten minutes for a whole or split fish and fillets, and ten to fifteen minutes for a one-inch steak. Avoid overcooking. Serve with lemon butter sauce.

Baking. A whole medium-sized fish or a portion of a large fish may be baked. Use the dry heat of a moderate oven, 325° F. Large thick portions are baked as they come, after seasoning. Whole fish may be stuffed. Particularly easy to serve is a boned, stuffed fish. Wipe fish with damp cloth; remove fins or not as desired. When stuffing is to be

TABLE XLIX · *Suggested Methods of Cooking and Serving Fin Fish*[1]

Fish	Season	Preparation at Market	Methods of Cooking	Relish or Sauce
Bass, black (lean) .	All year	Split; steaks; fillets	Sauté; broil; bake	Lemon sections; cucumber sauce; maître d'hôtel sauce
Bass, sea (fat) . .	All year	Split; fillets; whole	Sauté; broil; bake; stuff and bake	Mushroom sauce; parsley sauce; tomato sauce
Bass, striped (fat) .	All year	Steaks	Sauté; broil; bake	Cucumber sauce; onion relish
Bluefish (lean) . .	All year	Split; steaks; Whole	Broil; bake; plank Stuff and bake; plank	Sautéed bananas; sliced pickles; marinated sliced tomatoes; maître d'hôtel sauce
Butterfish (fat) .	April to December	Whole	Sauté; broil; bake	Chili sauce; tartar sauce; cucumber sauce
Cod (lean) . . .	All year	Steaks; fillets Whole	Sauté; fry; broil; bake; boil; steam; for chowder Stuff and bake; plank	Tomato sauce; caper sauce; Mornay sauce; egg sauce; Worcestershire or similar sauce
Eel (fat)	All year	Cut in pieces	Sauté; for chowder	Catsup; cole slaw; mustard pickles
Flounder (lean) .	All year	Whole; fillets	Sauté; fry; bake; broil; steam	Beet and cabbage slaw; parsley sauce; curry sauce; tartar sauce; mustard
Haddock (lean) .	All year	Whole; fillets; steaks	Stuff and bake; plank; bake; broil; boil; steam; sauté; fry; for chowder	Broiled tomato slices; fish sauce; pickled beets; parsley sauce; Mornay sauce
Hake (lean) . . .	All year	Whole Steaks; fillets	Stuff and bake Boil; broil; steam; sauté; fry	Marinated cucumber slices; horseradish relish; egg sauce
Halibut (fat) . .	All year	Thin steaks; thick steaks	Sauté; broil; fry; plank Boil or steam; bake; plank	Maître d'hôtel sauce; tomato sauce; Hollandaise sauce; fish sauce; sautéed canned pineapple slices
Mackerel (fat) . .	April to November	Whole Split; fillets	Stuff and bake; plank Broil; sauté; plank; bake	Cucumber sauce; cole slaw; sautéed bananas; maître d'hôtel sauce; marinated sliced tomatoes
Perch (lean) . . .	All year	Whole; fillets	Sauté; fry; broil; bake	Beet and cabbage slaw; crisp celery; parsley sauce; caper sauce
Pike (lean) . . .	All year	Fillets; steaks	Sauté; steam; boil; bake; broil	Caper sauce; cole slaw; tomato sauce; pickled beets; lemon sections
Pollock (lean) . .	All year	Fillets; steaks	Sauté; fry; bake; broil	Tartar sauce; radishes; maître d'hôtel sauce; stuffed olives; onion relish
Pompano (fat) . .	All year	Split; fillets	Broil; plank; bake; sauté	Melted butter; tomato sauce; dill-pickle slices
Salmon (fat) . . .	All year	Thin steak Thick steaks	Broil; bake; sauté Broil; steam; plank	Ripe and green olives; egg sauce; parsley sauce; Hollandaise sauce; mayonnaise; marinated cucumber slices
Shad (fat)	December to July	Split	Bake; plank	Lemon sections; sliced radishes; grape jelly; broiled tomatoes
Smelts (fat) . .	September to May	Whole	Sauté; fry; broil; bake	Catsup; tartar sauce; beet and cabbage slaw; marinated cucumber slices
Sole (lean) . . .	All year	Fillets	Broil; steam; boil; bake; sauté; fry	Fish sauce; curry sauce; parsley sauce; tartar sauce; Mornay sauce
Swordfish (lean) .	July to September	Steaks	Broil; sauté; bake	Lemon sections; cucumber sauce; sautéed bananas
Trout (lean) . . .	April to November	Whole; steaks	Sauté; fry; bake; broil; steam	Tartar sauce; melted butter; maître d'hôtel sauce; tomato and cabbage slaw
Whitefish (fat) . .	April to December	Split; fillets Whole	Broil; bake; plank; stuff and bake	Onion relish
Whiting (lean) . .	May to December	Whole; fillets	Sauté; fry; broil; bake	Fish sauce; egg sauce

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[1] *From Fish and Fishery Products*, War Department, Technical Bulletin TB QM 31, p. 50.

What's New in Home Economics

Method of Pan-Frying Fish · (*Upper left*) Roll serving portions of fish in milk or milk and egg and dip in seasoned flour, meal, or bread crumbs. (*Upper right*) When one side is browned, turn carefully. (*Lower left*) Place fish on absorbent paper, to remove excess fat. (*Lower right*) Serve with appropriate garnishes

used, fill about $\frac{2}{3}$ full and sew up the opening to hold the stuffing in. If fish is placed in a pan on a piece of oiled cheesecloth, it can be turned in cooking and removed without breaking. Wipe the outside with fat. Bake ten to twelve minutes for each pound or until fish flakes easily when tested with a fork.

Planked Fish. Special oak planks with a frame for serving are provided for this method of cooking. The fish are split and boned, or at least the backbone is removed. The plank is preheated in the oven, well greased, and the fish placed on it, skin side down. Salt and pepper and fat are added. It then may be baked in a moderate oven (350° F.), about 25 minutes for a 3-pound fish, or broiled under the heat. (For time, see Broiling, p. 251.) Add more fat to the top if necessary to prevent drying out. Serve on the plank.

Frying. Small whole fish or serving-sized pieces of larger fish may be either pan-fried or fried in deep fat. Use fats with a good flavor and a high smoking point (see page 138).

The fish is dipped in milk or milk and egg and dredged with a mixture of flour, meal, or fine bread crumbs, seasoned with salt and pepper. In pan-frying, brown one side in hot fat. This should require about three minutes for a $\frac{5}{8}$ inch slice. Thicker slices and whole fish may require more time. Then set the pan off the heat for two to three minutes to allow the heat to penetrate evenly. Turn the fish, replace over the heat, and cook the other side.

For deep-fat frying, place the fish in a single layer in a frying basket. Cook in fat at 375° F. until golden-brown. This should require from five to eight minutes.

Boiled, Poached, or Steamed. It is sometimes convenient to cook large fish (two to five pounds) in water, whole or in large pieces. The process is quite similar to that used in poaching eggs. The fish is covered with boiling salted water and held at below boiling temperature until cooked through. This will require about five minutes to each pound, if the fish is thin, and eight to ten minutes to each pound for thick portions. Special kettles with racks are available for cooking fish. If one is not on hand, a frying basket may be used, or the fish held in the water in a piece of cheesecloth. Adding vinegar to the water hastens the coagulation of the outer portions of the fish, helps to hold the shape, and adds flavor. Onions, bay leaves, and pepper corns may be added to the water for flavor. Poached fish is served with a rich, well-flavored sauce. Steaming requires almost twice as long as poaching. Since so little of the nutrient content of the fish is lost in cooking in water, steaming is not generally recommended.

Table XLIX gives a list of the most used varieties of fin fish, and suggests the general cooking methods suitable for each and the season each is available.

WAYS OF COOKING SHELLFISH

The general methods given above for cooking fin fish are used for shellfish. Shucked oysters and clams require no preliminary preparation except careful picking over to remove any bits of shell. Special directions will be given for the preliminary preparation of lobster, crab, and shrimp when purchased in the shell. No attempt will be made to discuss in detail specific methods for the preparation of shell fish. Certain differences in use will be pointed out and basic steps in preparation for use indicated.

Oysters. Oysters are served raw with condiments or a cocktail sauce or are cooked. They may be broiled in the shell with special seasoning; panned, or baked with butter, salt, and pepper just until the edges curl; or with cracker crumbs and milk and butter or margarine as scalloped oysters; creamed in a rich cream sauce; poached in milk as oyster stew; or dipped in egg and fried. The only precaution required is not to overcook them. Oysters need no cooking to make them tender. Just heat them to serving temperature. An overcooked oyster is a tough oyster.

Clams. Clams are most frequently served steamed in the shell, or in a thick soup or chowder. The making of a chowder is an art which varies from New England to Philadelphia, the limits of the fresh-clam area. For a New England chowder, to each dozen clams use a scant $\frac{1}{4}$ cup of diced salt pork, 1 small onion chopped, 1 tablespoon flour, 1 cup water and the clam liquor, 1 cup diced potatoes, 1 cup milk, salt and pepper to taste. Fry the salt pork and remove from the fat. Add onion to the fat and cook a few minutes, add the flour and blend well, add the water, any clam liquor, and the potatoes. Cook at low heat until the potatoes are done. Add the clams (chopped), the milk, salt, and pepper, and browned salt pork. Heat to serving temperature. Garnish with chopped parsley and serve. To make a Manhattan or Philadelphia clam chowder, substitute canned tomatoes for the milk.

Lobsters. Lobsters are at their best freshly boiled. To boil a lobster, heat 3 quarts of water and 3 tablespoons salt to the boiling point. Lift the lobster by the back or tail and drop head first into the boiling water. Cover, and count the cooking time after the water returns to boiling. Reduce heat and simmer (just below boiling) the lobster 5 minutes for the first pound and 3 minutes for each additional pound. Lobsters toughen and shrink with overcooking.

To remove the meat from the body, lay the lobster on its back. Cut through to the back with a knife, from the head to the tail. With your hands, force the lobster open into two halves. Remove the intestinal vein which runs through the tail meat just under the back. All other parts of the lobster are edible. Small indentations in the body cavity contain meat not to be overlooked. The green lobster liver fills much of the body cavity. It has excellent flavor. Scoop out the liver, mix with buttered bread crumbs, salt and pepper, a bit of grated onion and chopped parsley. Replace the liver mixture in the lobster and place under the broiler to brown. Boiled whole lobster may be served hot or cold with lemon butter sauce on the side for dunking.

Crabs. Soft-shell crabs should be washed carefully. The flaps on either side are lifted and the feathers removed. Also remove the apron, the pointed piece at the lower end of the shell. Dry well and cook immediately. These crabs may be cooked by broiling, or may be pan-fried or fried in deep fat after dipping in egg and crumbs.

Hard-shelled crabs are cooked like lobster. Remove apron, gills, intestine, and sand bag. Break the body in half, crack the claws, and pick out the meat. Use as you would the crab meat on the market, in cocktails, salads, served hot with drawn butter, or in creamed and escalloped dishes. For scalloped crab use a rich white sauce made with cream or top milk, 1 cup to 1 cup of crab meat. Season to taste, using salt, pepper, tabasco, and capers as desired. Add ½ cup buttered bread crumbs and place in oven to brown.

Fresh shrimp are called raw or green shrimp. The little black line found in the back is harmless, but the shrimp is more appetizing and attractive when it is removed. It is removed most easily when the shrimp is uncooked. First remove the shell, or split it with a knife down the back, then cut the meat just below the surface of the back. The sand vein can be lifted out in one piece. Shrimps are best added uncooked to baked dishes and casseroles. Watch the clock when you cook shrimp, as shrimp toughen and shrink with overcooking.

For use in cocktails, salads, and dishes requiring no cooking, shrimp are precooked. Cooking is desirable if raw shrimp must be held for any length of time. They are best if cooked in a flavored stock. Use 1 cup water for each pound of green shrimp, 2 peppercorns, a piece of bay leaf, ½ stalk celery, and 1 teaspoon salt. Simmer this stock for 5 minutes covered; then add the shrimp, shelled or unshelled. Cover tightly. Count the cooking time after the mixture returns to boiling. Boil for 5 minutes only, no longer. Remove the shrimp and save the stock. After cooling, the shrimp may be stored for a short time in the stock. Use shrimp prepared in this method as you would cooked, frozen, or canned shrimp.

Canned Fish. Canned fish is a cooked fish. It may be used as it comes from the can in salads or in chowders, creamed dishes, or scalloped dishes.

Dried and Salted Fish. Some forms of cured fish are used without cooking. If to be cooked they may require a short soaking to add water and remove excess of salt.

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XVIII · Dried Legumes and Nuts

Legumes and nuts are plant foods, characterized by their protein and energy content. Because of the similarity in composition and in the contribution which they make to the diet, they will be discussed together.

Legumes belong to the pulse family. The seeds and pods are used in succulent form as vegetables, but only the mature, dried seed will be considered here. They include the different varieties of beans,—navy, lima, kidney, chili, pinto, and soy,—lentils, and peas,—cow peas, black-eyed peas, and the green peas used in split form for soups. Peanuts also belong botanically to this group, although they are usually thought of as nuts, since their composition resembles that of the nuts more than that of the legumes.

Nuts are the seeds of certain trees. The kernel, which is enclosed in a hard shell, is the edible portion. The most common varieties are almonds, Brazil nuts, butternuts, cashew nuts, chestnuts, filberts or hazelnuts, hickory nuts, pecans, pine nuts, pistachios, and the different varieties of walnuts.

Dried Legumes Are Important in Low-Cost Diets · These are among the preferred kinds

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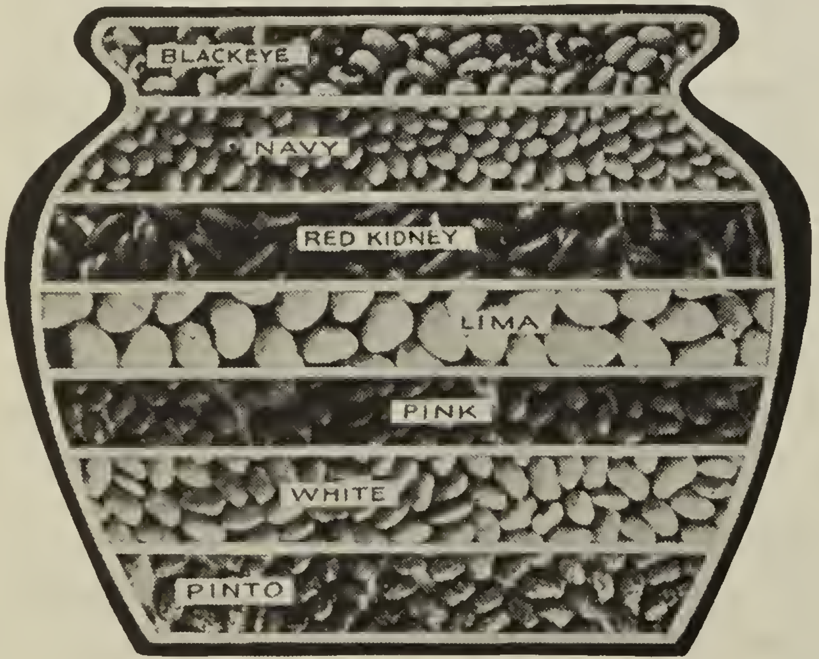

COMPOSITION AND NUTRITIVE VALUE

Dried legumes and nuts are good sources of protein; in some, the protein content is comparable to that found in lean meat, poultry, fish, eggs, and cheese. The proteins in legumes are, in general, not as efficient as those from animal sources. Legume proteins as a group are low in the amounts of certain important amino acids they contain. Peanuts and soybeans are exceptions; they contain proteins comparable in quality to those from animal proteins. The nut proteins also are of good quality and are comparable to animal proteins.

Both legumes and nuts contain some carbohydrate, largely in the form of starch. The legumes, with the exception of peanuts and soybeans, are more than half starch. The nuts, except chestnuts, contain less (carbohydrate)—from 7 to 17 per cent. Chestnuts are rich in starch. They contain 74 per cent total carbohydrate, most of which is starch.

The legumes as a group are low in fat. The exceptions are soybeans and peanuts. Nuts, on the other hand, with the exception of chestnuts, are extremely high in fat; some contain over 50 per cent. Pecans may have as much as 70 per cent fat.

Both legumes and nuts are good sources of minerals, especially calcium, iron, and phosphorus. The base-forming elements pre-

Table L · *Composition of Legumes and Nuts (Edible Portion)*

Protein Food	Water	Protein	Fat	Carbohydrate	Ash	Fuel Value per Pound
Dried navy beans	12.6	22.5	1.8	59.6	3.5	1,564
Dried Lima beans	10.4	18.1	1.5	65.9	4.1	1,586
Dried peas	9.5	24.6	1.0	62.0	2.9	1,612
Dried cowpeas	13.0	21.4	1.4	60.8	3.4	1,550
Lentils	8.4	25.7	1.0	59.2	5.7	1,581
Soybeans	7.5	33.0	21.0	29.6	5.0	1,993
Peanuts	9.2	25.8	38.6	24.4	2.0	2,490
Chestnuts (dried)	5.9	10.7	7.0	74.2	2.2	1,828
Almonds	4.8	21.0	54.9	17.3	2.0	2,940
Brazil nuts	5.3	17.0	66.8	7.0	3.9	3,162
Filberts	3.7	15.6	65.3	13.0	2.4	3,185
Hickory nuts	3.7	15.4	67.4	11.4	2.1	3,238
Pecans	2.7	9.6	70.5	15.3	1.9	3,330
Pistachios	4.2	22.3	54.0	16.3	3.2	2,905
California walnuts	2.5	18.4	64.4	13.0	1.7	3,200
Black walnuts	2.5	27.6	56.3	11.7	1.9	3,012

dominate, and they yield an alkaline ash. Legumes and nuts are good sources of the B vitamins. They are poor sources of vitamins A and C. Sprouted legumes, like sprouted cereals, are good sources of vitamin C. Bean sprouts form an important source of this vitamin in the Chinese diet.

The energy value of the legumes, as prepared for serving, is comparable to that of other protein foods. Nuts are high in calories, because of their high fat content. With the exception of chestnuts, the shelled nuts furnish approximately 3000 calories per pound.

Table L gives the composition of the legumes and nuts as purchased.

Bean Sprouts Are a Good Source of Vitamin C · Use uncooked in salads or lightly cooked as a vegetable, or in soups or stews

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DIGESTIBILITY

Legumes and nuts are neither as easily digested nor as completely absorbed as meat, fish, and eggs. In some forms, this is due to the presence of carbohydrates in the form of pentosans, which human beings do not digest. With some persons there is gas formation during the digestion of legumes. In general, however, legumes are digested with no discomfort if prepared so as to soften or remove the skin.

Nuts are rich in fat and compact in form. Although the high fat content may slow down digestion, when properly masticated nuts should cause no digestive difficulty and should be fairly well absorbed. The starch in chestnuts may cause discomfort if raw chestnuts are consumed in large amounts. For this reason chestnuts are often roasted or boiled. Boiling improves the digestibility at a sacrifice of texture.

ECONOMY AND USE IN THE DIET

Legumes and nuts have quite different uses in the diet. Legumes are cheaper, more stable, and more generally used than nuts. Nuts are looked upon as a food accessory rather than a basic component of the diet. When available in quantity they can supply fat and protein in many palatable dishes.

Legumes. The legumes rank with cereals as inexpensive sources of nutrients. They are grown in large quantities in various parts of the world and are easily shipped and stored, and so are cheap sources of protein, energy, minerals, and the B vitamins. For this reason legumes are useful in low-cost diets. They are especially effective when used with meat, eggs, and milk products containing high-quality protein. As a source of energy, they are comparable to cereals.

Soybeans are specially useful as a source of efficient protein. The Chinese, with their deficient supplies of animal protein, look to these beans as an important source of protein in their diets. They do not, however, use them as beans. The beans are ground and the protein is dissolved in hot water and with the fat is separated from the less easily digested portions of the bean by straining while hot. This milky liquid looks like milk and is called "soybean milk." It may be used in the form of the milk, but more frequently the proteins are separated in the same way as the curd of milk, for use fresh or as a cured soy cheese.

The United States Department of Agriculture gives the following directions for the preparation of soybean milk and curd.[1]

> *Method 1.* Wash dry soybeans and soak them overnight. Remove the skins by rubbing them off in the water; they will float to the surface and can be discarded. Grind the beans fine in a food grinder. Put the ground beans in a cheesecloth bag and immerse it in a bowl of lukewarm water, using 3 quarts of water to a pound of dry beans. Work thoroughly with the hands for 5 to 10 minutes, then wring the bag of pulp until it is dry. Boil the creamy white liquid over a low fire for 30 minutes, stirring frequently to prevent scorching. Add sugar and salt to taste. Keep in a cold place.
>
> *Method 2.* Wash soybeans, dry them thoroughly, then crack them by crushing coarsely in a food grinder. The skins then can be easily removed. Grind fine in the grinder. To each pound add 3 quarts of water and soak for 2 hours. Boil for 20 minutes, stirring constantly, then strain through cheesecloth. Add sugar and salt to taste. Keep in a cold place.

This milk contains two rather different proteins. One coagulates when the milk is boiled and can be skimmed from the top. It is used by the Chinese in making a well-seasoned dish resembling a stew. This dish is supposed to have been prepared first for the Buddhist priests during their preparation for communion with their gods. At this time they were allowed no meat but obtained in this product a protein of comparable quality. It has the texture of meat and takes on the flavor of the sauce in which it is served. These sauces, prepared as only the Chinese can, impart their elusive flavors to the otherwise tasteless proteins. This protein is sold in dried form in some Chinese shops.

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[1] *Soybeans and Soybean Products as Food*, Miscellaneous Publication No. 534, p. 11, 1943.

The other protein in the soybean milk is similar to casein and makes up the bulk of the bean protein. It is not coagulated by heating but is precipitated by the addition of a calcium salt and is separated as soybean curd. This also is a tasteless product in itself but is a good carrier of the flavors of the Chinese sauces and soups. It is an efficient protein and is readily utilized in this separated form. The use of a calcium salt to precipitate the curd adds needed calcium to the Chinese diets.

Soybean curds are prepared in this country either by adding vinegar to soybean milk or by letting the milk ferment naturally in a warm place. Vinegar gives a firm curd; fermentation gives a curd with texture like that of cream cheese. The best varieties of soybeans for curd are the yellow types. The curd may be used in soups, omelets, creamed eggs, and other such dishes. Table LI gives the proximate composition of soybeans and soybean products.

In this country, we have good supplies

Sliced Fresh Curd Is Drained on a Bamboo Rack and Cut into Pieces for Sale •
It is available in this country in stores catering to Oriental groups

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Table LI · Composition and Fuel Value of Soybeans and Soybean Products[1]

ITEM	WATER	PROTEIN (N × 5.7)	FAT	CARBOHYDRATE[2]	FIBER	ASH	CALORIES	
							Per 100 grams	Per Pound
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*		
Soybeans, green, shelled	67.	12.5	6.5	6.	1.5	1.5	132	600
Soybeans, whole mature seeds	7.5	34.9	18.1	12.	5.0	4.7	350	1,590
Soybean sprouts	82.3	8.5	1.8	6.3	.9	1.07	75	340
Soybean meal:								
Ground whole beans	8.9	35.7	18.0	12.	5.4	4.6	353	1,600
From press cake	6.2	41.8	5.7	15.	5.3	5.8	278	1,265
Soybean flour:								
High fat content	6.9	37.3	20.2	12.	2.5	4.7	379	1,720
From press cake	7.5	43.4	7.8	12.	2.6	5.8	292	1,325
Soybean curd or cheese, fresh	84.1	7.5	4.2	3.4	.1	.8	81	370
Soybean milk	92.6	3.4	1.5	2.0	.0	.5	35	160
Soy sauce, domestic or Oriental	65.	2.	1.	9.		20.	53	240

of animal proteins. We produce soybeans primarily as a source of fat and for animal feeding. The fat is extracted as a source of oil and the residue, largely protein and pentosans, goes into animal feeds and certain industrial uses. Since this product is known to be useful as a source of calcium, iron, and the B vitamins, as well as protein, relatively small amounts have been specially prepared for use as human food in the forms of low-fat soybean flours and meals. These are distributed largely through industrial channels, and reach the consumer in the form of mixed products: crackers, soups, and pancake mixes. Some of these flours are stable and might well be more widely used.

Full-fat soybean flour is on the market. This has a rich nutty flavor and is a good source of fat as well as protein, calcium, iron, and the B vitamins. The instability of some of these soy flours has retarded their distribution. When properly milled, full-fat soy flour is quite stable and makes a palatable, nutritious addition to breads, cookies and other baked products.

Nuts. Nuts vary considerably in popularity and in cost. Most varieties are more expensive than the legumes as sources of protein and energy but are in demand for their desirable flavor and texture.

Surprisingly enough the most used nut in this country is not really a nut but a legume, the peanut. English walnuts, pecans, almonds, and filberts come next in the amounts used in the order named. All these are produced commercially in this country. Brazil and cashew nuts are available only by import. In some parts of the country the woods still offer nuts for the gathering, black walnuts, hickory nuts, butternuts, beechnuts, and pine nuts.

From the standpoint of nutrition, the protein from nuts may be used interchangeably with animal proteins. As nuts are a concentrated food, high in protein and fat, they should be used in small quantities when used alone. They are well adapted for use in combination with other foods.

SELECTION AND CARE

Legumes. The kinds of legumes available in any market are determined by supply (particularly by production within a given area) and consumer preference for a particular variety.

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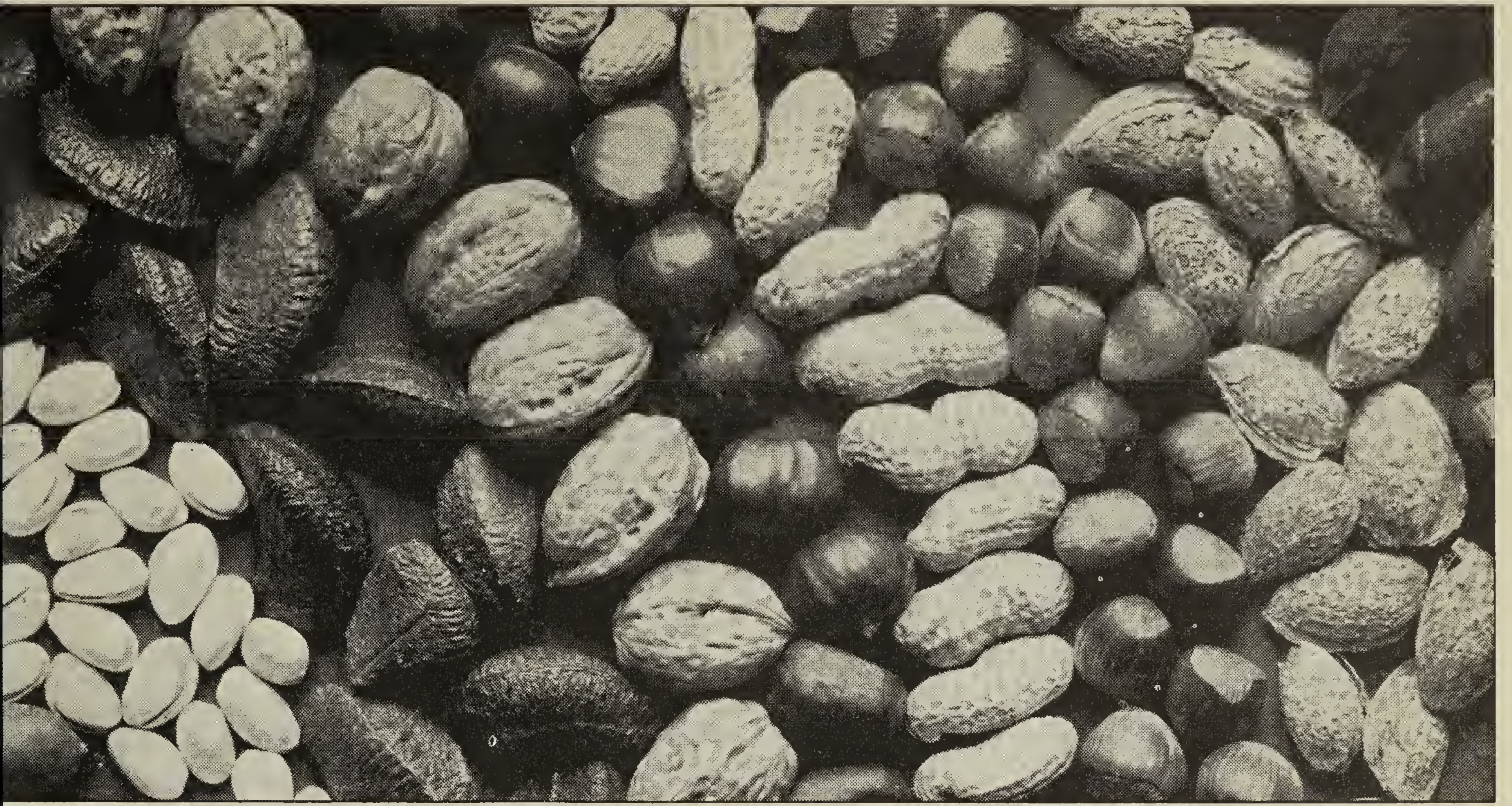
[1] From data compiled by the Bureau of Human Nutrition and Home Economics.

[2] These figures have been adjusted when necessary to represent nutritionally available carbohydrate.



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Nuts Are Used Raw or Lightly Toasted as Confections · They add distinctive flavor and texture to cooked dishes

New England prefers white navy beans; the South likes black-eyed and field peas, cooked with fat meat; the West uses pintos and red kidney beans, boiled, highly seasoned, and in chili con carne; and dried Limas are a general favorite in the Middle West.

Soys are newcomers, and not generally available. Some kinds are difficult to cook. Certain varieties[1] can be cooked easily and are palatable and nutritious. Gabanza beans imported from our neighbors to the South are found in some markets. Whatever the variety, beans should be clean, graded according to size, uniform in color, and free from molds or insects.

Dried legumes are among the foods most easily cared for, in both the market and the home. They should be kept fairly cool, in a dry place, away from insects. They are available in the market in bulk, and should be purchased by the pound rather than by measure. Some of the less common forms are marketed in packages at higher prices. Some packaged beans are precooked to reduce cooking time. Dried beans of all sorts are available canned ready to serve.

Nuts. Most of the important varieties of nuts now are cultivated in the United States. Native varieties have been improved and

Cookies Made from Full-Fat Soy Flour Are Both Tasty and Nutritious

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[1] For suggestions on varieties see bulletin on soybeans cited on page 264.

new varieties brought in and adapted to production here. Almonds and walnuts are grown in California; pecans and peanuts in the Gulf states; black walnuts and hickory nuts in the Middle West and East; chestnuts in Pennsylvania, Ohio, and the South. Many of these nuts are also imported from various parts of the world, and in addition nuts not produced in the United States: Brazil nuts come to us from Brazil and cashews and pistachios from other tropical areas.

Nuts may be purchased on the market in the shell or ready-shelled. Both forms are most often sold by the pound. The availability of shelled nuts is increasing with the development of machinery for cracking. Both fresh and salted nuts now are packaged in waxed paper or cellophane bags of various sizes and in airtight containers for holding over long periods.

In deciding between shelled and unshelled nuts one needs to know the weight of unshelled nuts required to make one pound shelled. This information is given in Table LII.

In purchasing nuts, whether in the shell or out, freshness is of great importance, since any rancidity affects the flavor. Shelled nuts are more likely to become stale than those in the shell. Nuts in the shell are more sanitary, since shelled nuts may be contaminated in handling. However, modern methods have been developed that safeguard the sanitary condition of shelled nuts. The cost per pound will vary with the season, the kind of nut, and the form in which it is marketed. Broken nut meats are satisfactory for most home uses and are cheaper than whole or half kernels.

Tᴀʙʟᴇ LII · *Approximate Amounts of Different Nuts Required to Yield One Pound of Shelled Nuts*[1]

Nut	In the Shell	Shelled Kernels
	Pounds	
Almond	3½	1 pound (3½ cups)
Filbert	2¼	1 pound (3½ cups)
Peanut	1½	1 pound (3 to 3½ cups)
Pecan	2½	1 pound (3½ cups)
Walnut, Eastern, black	5½	1 pound (3 cups broken; 4 cups halves)
Walnut, Persian (English) . . .	2½	1 pound (4 cups halves)

Care in storage is important for nuts of all kinds, both in the market and in the home. The high fat content of nuts makes it necessary to keep them away from the air, in a dry, cool, dark place. Shelled nuts should be kept in closely covered containers, in the refrigerator.

PREPARATION AND COOKERY OF LEGUMES AND NUTS

Legumes are always cooked before serving. Most nuts are preferred raw or lightly browned; they may be added raw to dishes in the process of cooking.

Legumes. The object in cooking dried legumes is to replace water lost in drying and to soften the cellulose hulls, cook the starch, improve the flavor, and increase the richness by the addition of fat.

When hard water is used in soaking and cooking legumes the time required to soften them is increased. The cooking time varies with the amount of calcium in the water and, to a certain extent, with the variety of legume. This seems to be due to the presence in the seed coat of a pectic acid which combines with any calcium in the water to form a substance that gives the skin a tough texture. This prevents the absorption of water and the softening of the bean. Some varieties, split peas for example, have this tough outer coat removed before cooking.

As with other dried foods, soaking to double in bulk, followed by long, slow cooking, is the best method of replacing the water lost in drying. Both in soaking and in cooking beans, soft water should be used if available. When the water is only temporarily hard, it should be boiled, the precipitate allowed to settle, and the water decanted from it used. If only permanently hard water is available, baking soda ($\frac{1}{8}$ teaspoon to each pint of water) should be added to the soaking water. Such water should be discarded before cooking, and fresh boiling water added to prevent darkening and disintegration of the outside before the beans are tender. The use of soda in this way decreases both soaking and cooking time and has little or no effect upon vitamin and mineral content.

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[1] Elizabeth Fuller Whiteman, *Nuts and Ways to Use Them.* Miscellaneous Publication No. 302, United States Department of Agriculture, 1938.

Salt should be added when the legumes are started to cook. The beans should be covered while cooking. Fat in some form improves the palatability and increases the food value of legumes. When fat meat is used it should be cooked with the beans.

BOILED NAVY BEANS. The beans should be soaked and cooked in soft water. When soft water is not available, temporarily hard water may be softened by the method suggested above. When only permanently hard water is available use soda as directed. The beans should be washed carefully and soaked in twice their measure of water until they double in bulk. This takes overnight or longer if cold water is used. The time may be shortened somewhat by using hot water.

The beans then should be simmered gently in the water in which they were soaked, unless soda has been used. Add boiling water as necessary to keep the beans just covered. The lid should be left on during the cooking and the water regulated in amount so that it will be absorbed by the time the beans are tender. Beans need salt and some kind of fat such as salt pork, bacon, bacon drippings, butter, or olive oil. If a melted fat is used, it can be added just before the beans are done. Fat meats should be cooked with the beans. Cook until they are soft all the way through, but still hold their shape. The time required will vary from 30 to 90 minutes, depending upon the variety of bean, the time of soaking, and the hardness of the water. During soaking and cooking, beans (and also other legumes) should increase two or three times in bulk.

OTHER BOILED LEGUMES. Any of the other legumes may be prepared in the same way. The cooking time will vary with the legume. The varieties of soybeans that require long cooking time are little used as beans for human food.

Bean soups, prepared from boiled beans, are both appetizing and nutritious. In these soups the beans may be mashed or purée. The latter method is preferred. The liquid in which the beans have been cooked is used in the soup. For additional liquid use vegetable stock, meat broth, or milk. Season to taste. Salt pork (diced and browned), hard-cooked eggs (finely chopped), minced onions, or chives may be added to these soups for flavor and interest.

BOSTON BAKED BEANS. Navy beans are soaked and cooked until they become tender. They are then placed in a bean pot, with the addition of salt pork, molasses, mustard, and onions, and baked very slowly. To 2 cups beans (measured before soaking) use $\frac{1}{8}$ to $\frac{1}{4}$ pound salt pork, $1\frac{1}{2}$ teaspoons salt, $\frac{1}{8}$ to $\frac{1}{4}$ cup molasses, and onions and mustard as desired. Any other beans, including certain varieties of soybeans, may be prepared in the same way.

LEGUME CROQUETTES. Croquettes may be made from any variety of cooked legume. The legumes should be sieved, seasoned, molded, coated with egg and crumbs, and fried in deep fat, like any other croquettes (see page 146).

LEGUME AND NUT LOAVES. Legume and nut loaves are palatable, and make nutritious main dishes. Combine approximately equal quantities of thoroughly cooked, sieved, well-seasoned legumes, and chopped nuts. The mixture is baked in a loaf similar to a meat loaf. A tomato sauce frequently is served with such a loaf.

Nuts. With the exception of chestnuts and peanuts, nuts are not high enough in starch to be considered unpalatable raw and in this form have a desirable texture. They are, therefore, used both uncooked and cooked, but some are improved in palatability by roasting. Peanuts and chestnuts are roasted to dextrinize the starch and then are ready to be used like other nuts.

Peanuts are rich in fat. Cooked with leafy greens they add both needed fat and flavor, as well as other desirable nutrients.

Chopped or coarsely ground nuts may be used instead of meat in croquettes and loaves, and finely ground nuts may provide the fats in baked products. Nuts contribute flavor and texture to salads, vegetable dishes, and desserts.

All nut kernels are covered with a skin coat. In some, as in pecans, hickory nuts, and walnuts, this skin is tender and is not objectionable. The skin on the peanut is tough but slips off easily after the nuts are roasted.

Nuts with tough skins like almonds and chestnuts are blanched before salting or using in prepared dishes. To blanch almonds pour boiling water over them to cover completely and hold at below boiling temperature (185° F.) for about three minutes. Drain off the hot water. The skins will come off easily if the pointed end of the nut is pressed between the thumb and forefinger.

For use in stuffings and certain desserts chestnuts are boiled in the shell or roasted in the oven (15 minutes in a moderate oven, 375° F.). Cut a gash on the flat side of the nut before boiling. Cook in boiling water to cover for 15 minutes. The shell and the brown skin should be removed while the kernel is still hot.

Roasting improves the flavor of almonds, English walnuts, and filberts, whether they are to be used as salted nuts, or in ice creams, or in confections. Nuts may be roasted either in the oven or in hot fat.

For oven-roasting, use 2 teaspoons cooking oil or table fat to each cup of nut meats. Mix the nuts and fat and spread in a single layer in a shallow pan. Heat in a moderate oven (375° F.), stirring frequently until heated through and lightly browned. Drain on absorbent paper and add salt while the nuts are still hot. For browning in fat use a frying basket or sieve. Cook in deep fat (oil is best) at a temperature of 300° F. As soon as they are light brown remove from the fat (6 or 7 minutes). They continue to cook after removal from the fat.

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XIX · Batters and Doughs

Batters and doughs are mixtures of flour and liquid in varying proportions. Other ingredients are added for tenderness, texture, flavor, and food value.

A batter, as its name indicates, is a mixture of such consistency that it can be beaten or stirred. Batters vary in stiffness and are designated as "pour" or "drop" batters. A pour batter is thin enough to be poured, while a thick or stiff batter will not pour but will drop from a spoon.

A dough is a flour mixture of such consistency that it can be handled or kneaded. There are soft doughs which are barely stiff enough to handle, while stiff doughs are kneaded with difficulty and usually are rolled or beaten.

Chemically, batters and doughs are exceedingly complicated mixtures. Practically, however, basic proportions and a few simple rules make it possible to control these mixtures so as to achieve the results desired. To do this, a knowledge of the results to be expected from the basic proportions of flour to liquid is advantageous.

CLASSIFICATION OF FLOUR MIXTURES

In order to establish basic proportions, standard terms must be used. The basic batters and doughs are classified in Table LIII and listed in the order of the amount of flour to liquid used. Popovers are the thinnest of the flour mixtures.

Different flours vary in the amount of liquid they will absorb. In working out the relative proportions of liquid to flour in any series of batters or doughs it is highly desirable to keep the kind and also the brand of flour the same. Even so, two sacks of the same brand and grade of flour may differ slightly in their power to absorb liquid. In the discussions which follow, it is assumed that an all-purpose, or "family," flour of medium hardness is used. The absolute necessity of accurate measurements is obvious.

TABLE LIII · *Classification of Basic Batters and Doughs*

Pour Batters	Drop Batters	Doughs
Popovers Griddle cakes Waffles Cakes (containing fat)	Muffins Drop cookies (variation of cake)	Biscuits Pastry Yeast breads Rolled cookies (variation of cake)

BASIC BATTERS AND VARIATIONS

The basic pour batters include popovers and their variations, griddle cakes, waffles, and cakes. Cream puffs might be considered a variation of popovers, since they contain the same proportion of liquid to flour. Waffles are very similar to one type of griddle cake and might be called a variation of it.

While plain cake is made from a sweet, rich muffin batter, cake batter pours, while basic muffin batter drops. Cake batter is softer than muffin batter because of the extra sugar, egg, and fat it contains.

Muffins are made from a typical drop batter. There are many variations of muffins. Drop cookies, which are a variation of cake, belong to this group.

Wheat Flour Institute

Popovers · They are best when served immediately, piping-hot

Basic proportions for each standard batter will be taken up separately. Some of the variations also will be discussed.

The simplest method of combining the ingredients for a batter is by the "batter method," sometimes called the "muffin method." This consists of first sifting together the dry ingredients, next combining the liquid ingredients—milk, beaten egg, and melted fat—and last adding the liquid ingredients to the dry and combining. When there is an exception to this method, mention is made of it in the discussion.

Popovers. Popovers are the thinnest of all batters, 1 cup of sifted flour to 1 cup of milk being standard proportions. In batters, the gluten (protein) of the flour is so dispersed or scattered that it is usually supplemented by protein from egg. The leavening in popovers is steam formed from the high proportion of liquid to flour. In order to hold in this steam, the walls of the popover must be strong, and egg protein makes them so. Unless popovers are made from hard wheat (bread) flour, at least 2 medium-sized eggs are needed to 1 cup each of flour and liquid. From no fat at all up to 1 tablespoon may be used. Salt is needed for flavor, about ½ teaspoon to the proportions given.

The ingredients are combined by the batter method and beaten smooth with an egg beater. Since strong walls are needed, and the batter is very thin, the popovers are beaten to develop the gluten in the flour. Baking cups of glass, earthenware, iron, or enamelware are the best, since they hold the heat. They should be heated and well greased and the batter poured in, filling them not more than half full. To form steam as soon as possible, a hot oven is needed at the beginning. Bake at 450° F. for 20 to 30 minutes or until the popovers pop from the force of the steam. When water is changed to steam, the volume is increased many times, and this sudden expansion forms the large central cavity typical of popovers. Further baking, after the popovers are hollow, makes them crisp and brown. The high temperature, if kept up, would make them too brown by the time the walls are cooked through. The temperature, therefore, should be lowered to 350° or 325° F. to finish cooking. Bake until the crust feels quite firm. Popovers soften when removed from the oven and will collapse unless thoroughly baked. If necessary the heat may be turned off to prevent their getting too brown while becoming crisp.

Yorkshire pudding is a variation of popovers. The proportions are identical, but instead of being baked in cups, the batter is poured into a pan containing hot drippings from roast beef. No fat is needed in the batter. It is baked at the same temperatures as popovers for about 30 minutes, then cut into squares for serving.

Timbales and cover batters. Timbale cases and rosettes are for the purpose of holding creamed dishes, such as chicken à la king. They are cooked in deep fat on irons that give them special shapes. They should be crisp and golden brown with a shell thick enough to hold the weight of the mixture to be served in them.

The same proportions of ingredients may be used for timbale cases and rosettes as for popovers, although more or less flour may be used, depending upon the hardness of the flour and the amount of egg. One to 2 eggs are used. Since timbale cases are cooked in fat, fat may be omitted from the batter. One to 2 teaspoons of sugar may be added to make them brown better.

The batter is mixed until free from lumps to avoid thickened places in the finished products. It should stand about half an hour before cooking, to allow any air bubbles to escape. If left in, the bubbles make holes or weak spots in the timbale cases.

The timbale iron is heated in the fat at 370° F. so that it will be of the same temperature as the fat. Then it is drained to remove excess fat and is dipped into a cup or bowl of the batter to about three fourths of its depth. The iron with the batter on it then is immersed in the hot fat and cooked for about one-half minute, or until golden brown and crisp. When the batter slips off the iron, the fat is too hot. When the cases are soft rather than crisp, the batter is too thick and should be thinned with milk.

The same proportions of ingredients used for popovers or for timbale cases may be used also for a cover batter for frying pieces of fruit, certain sliced meats, poultry, sliced eggplant, sliced onion rings, oysters, scallops, and other fish. Proportions that are easy to remember and that work well are these: 1 cup milk, 1 cup sifted flour, 1 egg, $\frac{1}{2}$ teaspoon salt, and 1 teaspoon fat. A somewhat thicker cover batter ($1\frac{1}{4}$ cups flour) is used for frying the juicy fruits and vegetables. For the thicker cover, the coating is improved by adding 1 teaspoon baking powder to each cup of flour.

Egg pancake is another variation of popovers with the proportion of egg double that of popovers. For a pancake to be baked in a nine-inch skillet, use half this quantity. There should be plenty of fat and the skillet should be hot. The pancake is baked at the same temperature as popovers but not so long, since it is folded or rolled like an omelet for serving. When used as a main dish, creamed meat, fish, chicken, or mushrooms may be added to the top of the pancake before folding. Butter, lemon juice, and powdered sugar, fruit sauce, or marmalade may be used when it is served as dessert or as a breakfast dish.

Cream puffs have the same proportion of flour to liquid as popovers, but a higher proportion of both fat and eggs. The liquid is usually water. The fat is increased to give tenderness and richness. The egg gives rigidity to the crust of the puffs and holds in place the high fat of the mixture during baking. To 1 cup each of liquid and flour, basic proportions for cream puffs include $\frac{1}{2}$ cup fat, 4 eggs, and 1 teaspoon salt.

If these ingredients were combined by the same method as for popovers, the fat, being in high proportion, would tend to float on top as soon as the mixture reached the melting point of the fat during baking. In order to hold the fat in suspension in the batter, and at the same time to make the mixture more tender, the fat is cooked with the flour

Cream Puffs · Cream puffs ready for baking, baked and filled sandwich style, with whipped cream

Wheat Flour Institute

Griddle Cakes · Use only enough fat to prevent sticking

and liquid and cooled somewhat before the eggs are added. The flour, salt, fat, and water may be combined and cooked the same way as in a cream sauce by melting the fat, blending in the flour and salt, adding the liquid, and bringing the mixture to a hard boil while stirring. Another method is to melt the fat by heating it in the liquid. With the high proportion of fat and of flour to water, the flour may be stirred directly into the liquid and fat without lumping. In either method, the mixture is cooked until it clings to the spoon, leaving the pan clean. It is cooled slightly and the unbeaten eggs are added, one at a time, with hard beating after each addition. The eggs and the flour then will hold the fat in suspension during baking and so prevent its separating and coming to the top.

Cream-puff batter (or *chou paste*, as it is called) is so thick that it holds its shape when dropped by spoonfuls on a baking sheet. It is started to bake in a 425° F. oven for ten minutes and then the temperature is reduced to 325° F. to finish baking. This requires a total of about 30 minutes.

Cream-puff batter is used also for éclairs. The only difference between a cream puff and an éclair is the shape: the puff is round, any size desired, while the éclair is finger-shaped.

The same mixture also may be fried in deep fat. Such fried puffs are called "queen fritters." The fritters pop in the fat just as they do when baked at the proper temperature.

Cream puffs and éclairs may be filled with thick custard, cream filling, whipped cream, or ice cream. A pastry bag with a tube is helpful for this purpose, since with it they can be filled through only a tiny opening. Queen fritters often are filled with jam or marmalade.

Griddle Cakes. The term "griddle cake," "pancake," or "hotcake" covers a wide range of products made from batters of varying proportions. A very thin batter high in egg is used in a French pancake, and a thick fluffy batter with little or even no egg in the well-known "hot cakes." Standard griddle cakes of the American type only will be discussed here. Such griddle cakes may be made of all white flour or of a combination of flour and cereal or meal. Standard griddle cakes have more flour than any batter discussed so far.

Griddle cakes are partly leavened by steam, but as the flour is increased above that used in the batters of the popover group, the addition of leavening becomes necessary except when self-rising flour or ready mixes are used. Baking powder is added, or with sour milk soda may be used. The proportions of both flour and baking powder may be varied to secure a thin or a moist thick griddle cake. The consistency of the batter made by using $1\frac{1}{3}$ to $1\frac{1}{2}$ cups flour to 1 of liquid can be changed by increasing the amount of baking powder. As baking powder is increased the batter becomes stiffer and the cakes less moist, more porous, more tender, and thicker when cooked, than cakes made with little or no added leavening. This more tender griddle cake of greater volume seems the desired standard in this country.

When baking powder is used, as it is in the type of cake described, basic proportions consist of 1 teaspoon powder to each cup flour, unless a fast-acting powder is used which requires 1½ teaspoons to each cup flour. If sour milk is the liquid, a scant ½ teaspoon baking soda is needed to each cup sour milk. This will leaven 1 cup of flour.

For each cup liquid, ½ to 1 egg may be used and 1 tablespoon fat. From ½ to ¾ teaspoon salt is added, and sugar may be added up to 1 tablespoon to increase browning. The batter method of combining the ingredients is used. Beating a flour mixture develops the gluten and should be avoided in this type of cake. When mixed only enough to combine the ingredients the cakes are more tender.

Griddle cakes are cooked on a flat hot surface or griddle, with only enough fat on the griddle to prevent sticking. Some types of griddles require very little or no fat. The heat should be regulated so that when the under side is browned, the top has lost its sheen and is just set. If the cakes are turned before the top is slightly set, the cells will not bear the weight of the cake and it will flatten. If the top is too well done it does not form an attractive crust and is pitted by the holes made by escaping steam and gas. A griddle cake never should be turned more than once. If a second turning seems necessary the first was made too soon.

The cooked cakes may be stacked, or the thinner ones rolled for serving. The important thing is to serve them hot.

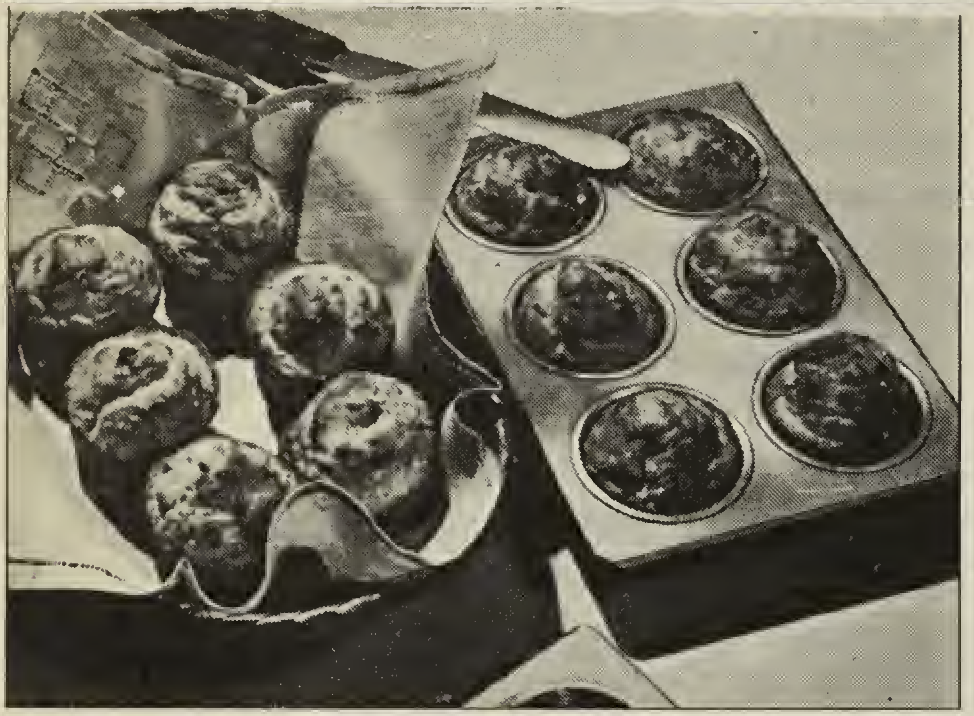
Waffles. Waffles might be considered a variation of griddle cakes. When the American type of griddle cake containing egg and leavening is cooked in a special iron, instead of on a griddle, it becomes a waffle. The iron is so arranged as to give a relatively large surface or crust. To give the desirable crispness and tenderness, extra egg and fat are used. Not less than 1 egg (2 are better) or less than 2 tablespoons fat to each cup liquid and 1½ cups flour are basic proportions for standard waffles. Three tablespoons fat are sometimes best with some electric waffle irons to prevent sticking. When high proportions of egg and fat are used the flour may need to be increased.

For extra crispness and lightness, the eggs may be separated and the stiffly beaten whites folded in last. When this method is used the baking powder may be decreased ½ teaspoon for each white.

The temperature of cooking also affects the crispness of the waffle. The iron should be hot, though not smoking, before the batter is poured onto it. The newer models of electric waffle irons have a gauge indicating the proper temperature. This is approximately 450° F. Also, the temperature of the iron can be judged by putting a drop of water on it. If the drop dances, the iron is right. (This same test may be used for a griddle.) If the iron is of the proper temperature the waffle is done when it is an attractive brown and loosens from the iron.

Muffins. Muffins are typical drop batters. Basic proportions of all-purpose flour to liquid being two to one, with 1 egg, 2 tablespoons fat, 2 to 3 teaspoons baking powder, ¾ teaspoon salt and from none to 2 tablespoons sugar. When self-rising flour is used, leavening and salt are omitted. With this amount of flour overmixing has an even greater effect upon the finished product than in any pour batter. The ingredients should be mixed only until the flour is moistened, not stirred until smooth. This prevents unnecessary development of the gluten in the flour and keeps the muffins tender. Soft-wheat flour makes more tender muffins than hard-wheat flour.

Muffins are baked in muffin pans, well greased in the bottom to prevent their sticking. The pans should be filled three-fourths full. A hot oven, approximately 400° to



Steps in Making Muffins · (*Upper left*) Add liquid to dry ingredients, and mix until the flour is just moistened. (*Upper right*) Fill the pans three-fourths full. (*Lower left*) The cooked muffins should be light, evenly browned, and have a pebbled, not a smooth, surface

What's New in Home Economics

425° F., is best for most muffins. They should be baked until they are browned and firm to the touch. This requires approximately 20 minutes, although the time varies with the size of the muffin and the temperature of the oven.

The outside of a perfect muffin is an attractive golden brown. It is symmetrical in shape and only slightly rounded on top, with no peaks or knobs or places where the batter has spilled through the crust. A good muffin is very light to the touch when one picks it up. It is somewhat pebbled in appearance, not smooth and even on its surface. Inside it has an even texture, made up of round holes, fairly uniform in size, with no long narrow tunnels. Muffins which are peaked on top and have tunnels inside are the result of overmixing or too thin a batter and too hot an oven. Also, when the oven is too hot, a crust forms before the muffins are through rising, and the batter breaks the crust and spills through.

Muffins may be varied by the kind of flour, meal, or cereals used in them. Muffins made by using all corn meal or whole wheat have characteristic flavor and texture. For a light muffin approximately half the flour is white. Whole wheat, corn meal, rolled oats, bran, or other flours, cereals, or meals may be substituted for the remainder of the flour. Bran muffins are usually better if the bran is soaked in a part of the milk before the ingredients are combined. The milk may be warmed first. For variety, raisins and other dried fruit and nuts may be added to muffin mixtures. These are stirred into the dry ingredients before the liquids are added.

Brown sugar or molasses may be used as sweetening, and for variety and additional sweetness a spoon of jelly, marmalade, or jam may be placed in the center of each muffin as the pans are filled. The amount of sugar may be increased if a sweeter muffin is wanted. Unless the egg also is increased, it is best not to use more than 2 tablespoons of sugar to each cup of flour.

Quick loaf breads, such as those which have fruit and nuts added, are merely variations of muffins. They are made of the richer muffin mixtures and baked in loaf pans. For a loaf, the oven temperature should be lower than for muffins, about 350° F. for a small or medium loaf.

Drop Fritters and Dumplings. Fritters may be made by coating pieces or slices of fruit, vegetable, or meat with a cover batter (popover mixture) and frying them in deep fat. Another type of fritter has fruit, vegetable, or meat chopped or in small pieces, held together with a drop batter (muffin mixture) and fried. Corn and other vegetables, chopped fruit, and meat are made into fritters of this kind. Proportions for standard white muffins give good results in this type of fritter. To decrease absorption of fat, however, the amount of egg is usually doubled, and the fat usually is omitted or reduced.

The chopped food is added to the batter with as little stirring as possible, and the mixture dropped by spoonfuls into deep fat at about 365° F. When browned on both sides (about two minutes), drain on a paper towel and serve hot. Fruit fritters may be dusted with powdered sugar.

Drop dumplings may be made by dropping muffin batter by spoonfuls on top of stews and fricassees of meat or poultry, covering closely and steaming for 15 to 20 minutes. For dumplings to serve with meat, use no sugar. Steamed fruit dumplings are made in the same way as drop fritters, by binding pieces of fruit together with a slightly sweet muffin batter and then steaming over a fruit sauce or in a steamer.

A good dumpling, like a good muffin, should be light. To obtain this result, not only are correct proportions essential, but the dumplings should remain above the liquid, and the lid left in place until the dumplings have risen and are done. This requires 15 to 20 minutes.

Plain Cake. Cakes containing fat are modifications of sweet, rich muffins. When the sugar is increased enough for the mixture to be called cake, the extra sugar increases its weight. This extra weight will cause the product to fall during baking unless the batter is strengthened by more egg. The added egg toughens the product and to counteract this effect, more fat is needed to make the cake tender.

Plain cake is made with the basic proportions for standard muffins, by increasing the sugar up to one half as much by measure as flour, and by using 1 egg and 3 to 4 tablespoons fat for each cup of flour. These increased amounts of sugar, eggs, and fat tend to make the batter thin, so the liquid is decreased; thus the amount of flour to liquid is increased.

Plain cake may be combined by the batter or muffin method. There are other methods, however, which produce cakes of better texture. These are discussed in detail in the chapter on "Cakes Containing Fat."

There are many variations of cake batters, from very plain muffin-like cup cakes to very rich cakes baked in layers or loaves. Flavoring, such as vanilla, is usually added to cake batter.

Gingerbread is a plain cake, or a sweet, rich muffin, flavored with certain spices, particularly ginger, cinnamon, nutmeg, and cloves. Part or all of the sugar content of gingerbread is usually in the form of molasses and the liquid may be water or sour milk. With molasses and sour milk, baking soda is used as part or all of the leavening.

Cookies, doughnuts, and other small cakes are modifications of cake. These are all discussed in the chapter on cakes.

Table LIV gives basic proportions for the standard batters and some of their many variations, showing the relationship among these different flour and liquid mixtures.

Table LIV · *Proportions for Basic Batters and Some Variations*[1]

Batter	Liquid	Sifted Flour (All-Purpose)	Leavening[2]	Eggs	Fat	Salt[2]	Sugar	Method	Comments	Amount
Popovers	1 c. sweet milk	1 c.	steam	2	0 to 1 tbsp.	½ tsp.	0	Batter (beat)	450°–350° F.	8 medium
Yorkshire pudding	1 c. sweet milk	1 c.	steam	2	0	0 to ½ tsp.	0	Batter (beat)	450°–350° F.	8 servings
Timbale cases, cover batters	1 c. sweet milk	¾ to 1¼ c.	steam	1 to 2	0 to 1 tsp.	½ to ¾ tsp.	0 to ½ tbsp.	Batter	Fry 360°–370° F.	2 dozen cases
Egg pancake	1 c. sweet milk	1 c.	steam	4	0 to 2 tbsp.	1 tsp.	0	Batter (beat)	450°–350° F.	2 (9 inch)
Cream puffs	1 c. water	1 c.	steam	4 (1 c.)	½ c.	½ tsp. or more	0	Cook liquid, fat, flour, first	425°–325° F.	8 to 12
Queen fritters	1 c. water	1 c.	steam	4	½ c.	½ tsp. or more	0	Same as cream puffs	Fry in deep fat	2 dozen small
Griddle cakes	1 c. sweet milk	1½ c.	1½ tsp. b.p.	1	1 to 2 tbsp.	¾ tsp.	0 to 1½ tbsp.	Batter (do not beat)	Griddle	4 servings
Waffles	1 c. sweet milk	1½ c.	1 tsp. b. p.	2 (sep.)	2 tbsp.	¾ tsp.	0 to 1½ tbsp.	Batter (do not beat)	Waffle iron	4 waffles
Plain muffins	1 c. sweet milk	2 c.	2 to 3 tsp. b. p.	1	2 tbsp.	½ to ¾ tsp.	0 to 2 tbsp.	Muffin	400°–425° F.	8 to 12
Drop fritters	1 c. sweet milk	2 c.	2 to 3 tsp. b. p.	2	0 to 1 tbsp.	½ to ¾ tsp.	0 to 2 tbsp.	Muffin	Fry 350°–360° F.	2 dozen
Drop dumplings	1 c. sweet milk	2 c.	2 to 3 tsp. b. p.	1	0 to 2 tbsp.	½ to ¾ tsp.	0 to 4 tbsp.	Muffin	Steam	1 dozen
Plain cake	1 c. sweet milk	2½ to 3c.	2½ to 4½ tsp. b. p.	2	½ c.	½ to 1 tsp.	1 to 1½ c.	Muffin or cake	375° F.	2 to 3 layers
Gingerbread	½ c. milk, also molasses	2 c. (2 tsp. ginger)	1 tsp. b. p. ½ tsp. soda	1	¼ c.	¾ tsp.	1 c. molasses	Muffin	350° F.	12 servings

BASIC DOUGHS AND VARIATIONS

Proportions for the doughs are developed on the basis of the flour. The liquids and the dry ingredients are combined to obtain a definite consistency which is easily checked. The basic doughs include biscuits, pastry, and yeast-leavened bread. There are many variations of each of these doughs.

Biscuits. Biscuits are the simplest of the doughs. They are the most quickly and easily made of all the batters and doughs when there is an understanding of what is to be accomplished and some skill has been developed in handling the mixture. Success in making biscuits, and also in making pastry, requires not only correct proportions of the ingredients, but also the skill which comes with practice after understanding the principles involved.

The usual proportion of liquid to flour in biscuits is 1 part liquid to 3 of flour, by measure. This amount will vary with the kind of flour. Soft-wheat flour, which makes the most tender biscuits, takes up less liquid than hard-wheat flour. The other ingredients include baking powder (1 to 1½ teaspoons for each cup sifted flour), salt (½ teaspoon for a cup flour), and fat (1 to 2 tablespoons for each cup flour).

No egg is used in standard biscuits, and the method of combining the ingredients is different from the general method used for the batters. The reason for the change in the method is the texture which is desired in the finished product. A flaky texture is considered best in biscuits and their vari-

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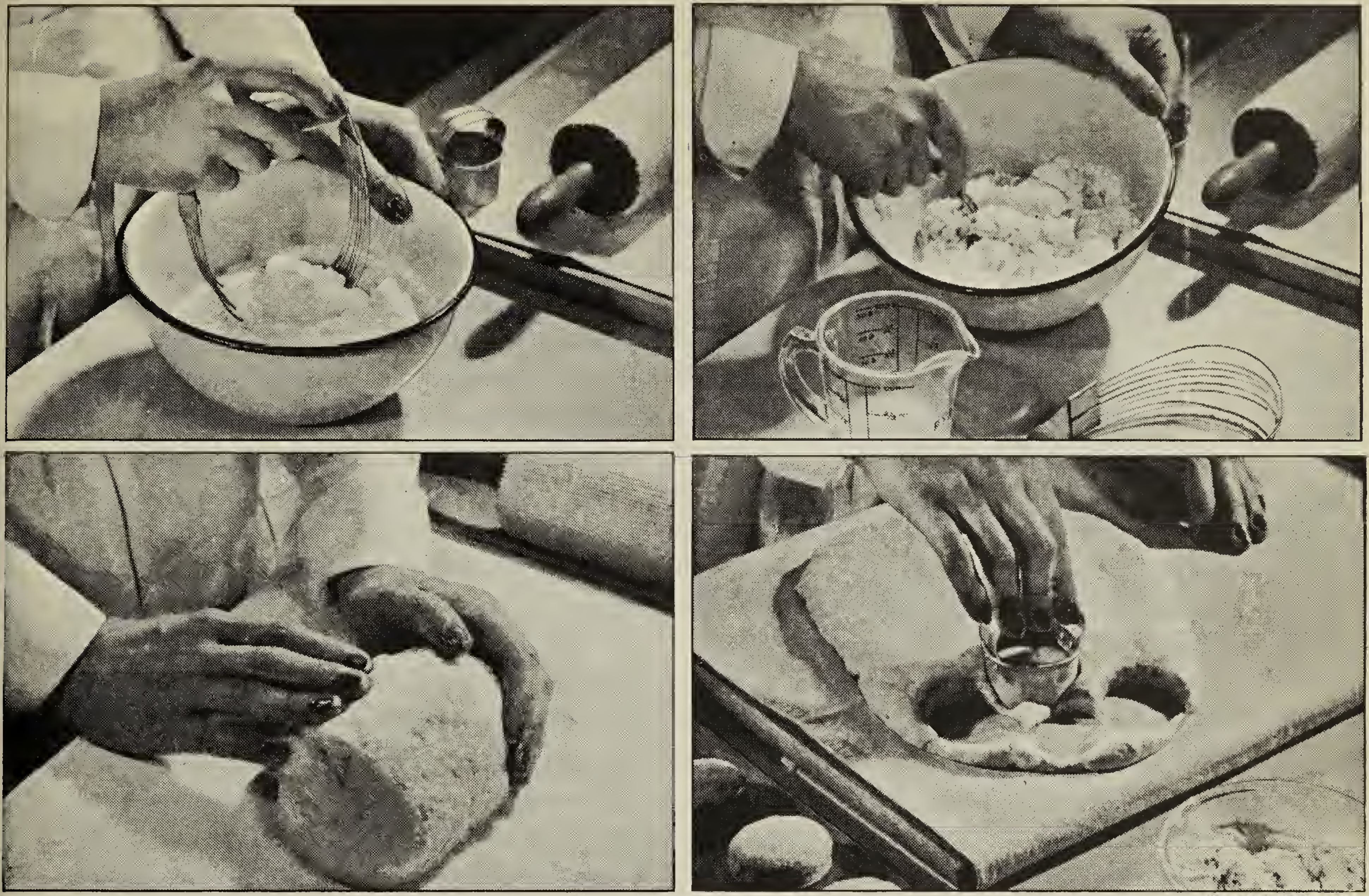
[1] *Boldfaced* batters are basic batters; others are variations.

[2] Omitted when self-rising flour is used.



General Mills, Inc.

Correct Method for Making Biscuits · (*Upper left*) Cut the fat into the sifted dry ingredients until the mixture resembles coarse cornmeal. (*Upper right*) Add milk and stir quickly to form dough. (*Lower left*) Knead gently for about half a minute. (*Lower right*) Pat or roll to desired thickness, cut with a floured cutter, and bake on a sheet in a hot oven (450° F.)

ations, and also in pastry. To achieve this, a solid plastic fat is used. It is chopped or rubbed into the sifted dry ingredients, rather than melted and added with the liquid, as in the batters. The fat is chopped into the flour mixture with two knives or spatulas, a biscuit cutter or a pastry blender, or rubbed in with the fingertips. When the mixture resembles coarse corn meal, the milk is poured into a well in the flour-fat mixture, all at once if the correct amount has been determined for the flour being used. The milk then is stirred vigorously with the other ingredients until the mixture thickens. This step should require less than a half minute. The dough then is turned onto a lightly floured board or pastry canvas and quickly and gently kneaded for about half a minute.

To make biscuits with large volume and tender flaky crumb, this slight kneading is essential. It develops the gluten so that it will hold the leavening gas. This makes the dough elastic and it will stretch to a large volume. It also distributes the baking powder so that it can do its best work. Too much kneading, on the other hand, results in a loss of gas from the dough and toughening of the gluten, thus producing biscuits of small volume and tough texture. It is, therefore, important to give biscuits the exact amount of kneading which they require. Here is where skill from practice is a factor.

After slight kneading, the soft dough is rolled gently or patted to the desired thickness, about one-half inch or slightly thicker. Cut the dough with a floured cutter, making biscuits of the size desired. It is best to cut as many biscuits as possible from the first rolling, since the second handling may toughen them somewhat. Place the biscuits on an ungreased baking sheet, using a spatula to lift them. A sheet with no sides permits the biscuits to brown better then a pan. If biscuits with crusty sides are preferred, they are placed at least a half inch apart on the sheet. If softer ones are the choice, let them touch each other.

Unless the biscuits are unusually large, bake at 450° F. for 10 to 12 minutes or until the crust is an even brown. Larger biscuits need a little longer time.

Good biscuits are very light. After baking they are at least twice the volume of the unbaked biscuits. They are even and symmetrical in shape, with vertical sides and level tops; they neither bulge in any place nor show any tendency to flatten. The tops are fairly smooth with a tender, pale, golden-brown crust. They are flaky and tender inside, and should be served piping-hot, just out of the oven. A good biscuit never, never waits for the guest!

There are many variations of biscuits. Sour milk may be used in place of sweet, in which case a scant $\frac{1}{2}$ teaspoon baking soda is used for each cup sour milk. This amount of soda and sour milk will leaven 1 cup flour. Additional baking powder will be needed for the remaining flour. Both the soda and baking powder are sifted with the other dry ingredients.

Drop Biscuits and Dumplings. Drop biscuits are made by adding more milk so that instead of a soft dough, a drop batter is formed. This batter is stirred for not over one-half minute, then dropped from a spoon onto a baking sheet, and baked like kneaded biscuits. The drop biscuits are irregular in shape but should be very tender. Drop-biscuit batter may be used for dropped dumplings, in the same way as dumplings are made on a muffin basis. When they are to be cooked with meat stew or stewed chicken, the fat may be decreased or omitted.

Other variations of biscuits include the addition of grated cheese, grated orange rind, peanut butter, or chopped nuts. About $\frac{1}{4}$ to $\frac{1}{3}$ as much grated cheese as flour (by measure) is a good amount. Half this amount of orange rind, peanut butter, or nuts would be sufficient. Orange juice may be used in place of milk for orange biscuits. Cheese, peanut butter, and nuts add fat to the biscuits and, therefore, the other fat may be decreased slightly.

Scones. Scottish scones are another variation of biscuits. They have egg added to a rich biscuit dough in the proportion of 1 to 2 eggs to 2 cups flour. The tops usually are brushed with egg. The liquid is sometimes cream. When cream is used the other fat may be decreased. The egg, slightly beaten, is added to the cream or milk, the two combined amounting to approximately $\frac{1}{3}$ as much, by measure, as flour. A small amount of sugar ($\frac{1}{2}$ to 1 tablespoon to each cup flour) is sometimes added. Currants also may be added. These are stirred into the flour-fat mixture before the liquid is added. Scones are cut in various shapes—diamond, square, pie-shaped, and round.

Since scones are richer than biscuits they do not dry out so easily and may be served cold or reheated. Both biscuits and scones are good split and toasted. In England and Scotland scones are used frequently to accompany tea.

Shortcake and Dumplings. Shortcake is a variation of biscuits. It is made from a rich biscuit dough. It may have sugar added, when it is a dessert shortcake. The fat may vary from 2 to 4 tablespoons per cup flour. If sugar is used, from $\frac{1}{2}$ to 1 tablespoon for each cup flour is usually sufficient. The sugar is sifted with the other dry ingredients.

Shortcake is often baked in two layers, with butter or other fat brushed over the bottom layer before the top one is put on, so that the shortcake will split easily. In this case, the dough is rolled about one-fourth inch thick. It may be cut and baked as individual shortcakes, as large round cakes the size of a pie, or baked in a sheet. Since shortcakes are usually larger than biscuits and may contain sugar, the baking temperature should be approximately 425° F.

Shortcake dough may be used in place of pastry for baked fruit dumplings. It is rolled a little less than one-fourth inch thick and cut in squares or circles large enough completely to surround peeled and cored apples, or other fruit to which sugar, spices, and butter may be added. The edges of the dough are moistened and pressed together. The dumplings then are baked or cooked by a combination of steaming and baking until the fruit is tender and the dough is cooked. The dumplings are served with cream or a sauce.

Shortcake dough may be used instead of pastry for fruit cobblers, deep-dish pies, and fruit rolls. It may be used also for meat pies, without sugar. When used for meat pies, meat drippings may be substituted for other shortening, if desired.

Plain Pastry. Plain pastry or pie dough differs from biscuit and shortcake in that it contains a higher proportion of fat and a lower proportion of liquid. This makes it a very stiff dough. At least $\frac{1}{4}$ as much fat as flour, by measure, must be used in pastry. If this amount of fat is to make tender pastry, the fat used must be one of high shortening value. Even then, if the flour is hard wheat, one third as much fat as flour may be preferred.

U. S. Bureau of Home Economics

Strawberry Shortcake • A rich biscuit dough makes a tender flaky base for this shortcake

The fat should be cold and is cut into the flour and salt until the fat particles are about the size of peas and coated with flour. The salt, $\frac{1}{2}$ teaspoon to each cup flour, is mixed with the flour and fat.

The liquid (cold water) is added so as to be distributed evenly among the fat-flour particles, just enough being used to dampen the surface so that the particles of fat-flour will form a dough, but not enough to make them sticky. Too much water makes a tough pastry; too little a crumbly one. Also, when there is not enough liquid to form steam, pastry is not light. Steam and the enclosed air are the only leavening in pastry. The exact amount of water varies with the kind of flour and the amount of fat. An average amount is about 3 tablespoons per cup flour.

Sprinkle the cold water over the flour-fat mixture by teaspoonfuls. Bring each dampened part into contact with as much of the dry material as possible by running a fork along the bottom of the bowl and, with a tossing motion, working the dampened part quickly into a dough. Add more water sparingly until the mixture becomes a stiff dough which works into a ball.

The ball of dough is then placed on a lightly floured board or pastry cloth. Enough pastry for one crust is rolled at one time.

(One cup flour makes enough for one nine-inch crust.) Pat the ball until it is flat on top. With the rolling pin lightly floured, place it on the center of the dough. Roll with quick, successive, short strokes from the center of the pastry toward the edge in every direction, keeping the shape round. If the dough begins to stick, as can be seen by its failing to spread, loosen it with a spatula. Then raise the dough gently with one hand and flour the board lightly with the other. Pastry should not be turned over during rolling. Pie crust should be rolled to almost one-eighth inch thick and nine or ten inches in diameter. It is then ready to be transferred to the pie pan.

Various kinds of pie pans are available. The thin ones made of tin or aluminum generally are used, although many homemakers prefer glass. All these allow the under crust to be thoroughly baked. A soggy, half-baked under crust makes an unpalatable pie. The pan should be deep enough to allow for plenty of filling without danger of its running over. Standard pie pans are eight or nine inches in diameter.

To facilitate the transfer of the pie dough to the pie pan, the dough may be rolled onto the rolling pin and then rolled off onto the pan. Another method is to fold half the dough lightly over the other half, making a semicircle of dough, and folding again, making a quarter-circle. This is placed directly on the pie pan and unfolded, fitted loosely into the pan, and pressed down into the angle between the side and the bottom. Pie dough should never be stretched or broken but handled gently, the air between the dough and the pan being worked out by patting with a small ball of dough.

As to how the pastry is treated from this point depends upon the kind of pie. The shell to be baked without filling will be discussed here. For other ways of handling pastry see pages 331 to 333.

The pastry is pressed firmly to the rim of the pan with the fingers or the tines of a fork. Any excess pastry is trimmed off even with the pan, or about one-half inch larger than the pan, using scissors or a knife. In the latter case, the extra dough is folded back onto the rim of the pan, making a half-inch of double pastry. This double edge is crimped together with the forefingers and thumbs into a fluting that stands up above the edge of the pan. The pie dough should be pricked every two or three inches with a fork over the bottom and sides. This lets out the air which otherwise would expand when heated and would give the pie shell a bad shape.

The pie shell should be baked in a hot oven, 450° F. for 10 to 12 minutes until slightly browned. It is ready then to be filled with any ready-to-serve filling, such as a cream filling. (See page 332.)

Good pastry is flaky, that is, its surface has a blistered appearance rather than a smooth one, and when it is broken, layers are plainly distinguished. Also, good pastry is very tender and cuts easily with a fork. It should not be so tender, however, that it crumbles when cut. It is a golden brown on the edges and a lighter brown on the bottom. The best pastry retains its crispness after filling.

The method of making hot-water pastry is discussed on page 322. There are also richer pastries than pie crust. These variations are discussed along with methods of preparing different kinds of pies in the chapter on "Pies and Other Pastries."

Yeast Breads. Yeast-leavened breads, sometimes called light breads, and salt-rising bread are usually made from doughs somewhat stiffer than biscuits, though not so stiff as pastry, with approximately $\frac{1}{4}$ to $\frac{1}{3}$ as much liquid as flour. The exact proportions vary, however, with the kind of flour and the kind and amounts of the other ingredients. Soft wheat flours may be used in the preparation of these breads, but the harder or stronger flours give better results because of the amount and character of the gluten. Whole-wheat flour and mixtures of white flour with whole wheat, rye, oatmeal, and other flours and meals also are used.

The kind of leavening used in these breads is responsible for the greatest difference between the methods of making them and the methods of making quick breads. Instead of chemicals, such as baking powder and soda, the leavening consists of living organisms or microscopic plants, yeast in yeast breads and harmless, gas-forming bacteria in salt-rising bread. Such leavening agents require very different handling from the chemical leavening agents used in most batters and doughs.

Since yeast breads and rolls are the ones of this group which are generally used, they are discussed briefly here. In a later chapter (see page 310) yeast breads are taken up in more detail, with some of the variations. Salt-rising bread also is discussed in that chapter.

INGREDIENTS AND PROPORTIONS. The essential ingredients for yeast breads are flour, liquid, and yeast. To supply quick food for the yeast and to add flavor and make the bread brown better, sugar generally is used in small amounts; salt is added for flavor; and fat is used to improve tenderness, flavor, and keeping quality. Eggs are not necessary in plain bread or rolls, but they increase the nutritive value and richness of fancy breads and rolls, and they vary the grain and the texture of the crust. Fruits, spices, nuts, and extra sugar in various forms are used in fancy yeast breads and rolls.

Basic proportions for yeast bread or rolls, based on 1 cup liquid (water or milk or both), consist of one package fast-rising dry yeast or one cake compressed yeast, 1 tablespoon sugar, 1 teaspoon salt, 1 tablespoon fat, and 3 to 4 cups flour.

The method of combining and handling these ingredients consists in providing the proper conditions for the development of the yeast, a thorough mixing of the flour and liquid, the development of the gluten to give strength and structure to the dough, the distribution of the gas formed by the yeast, and the final baking. To accomplish these objectives the making of yeast bread or rolls consists of six main steps: (1) mixing the ingredients, (2) kneading the dough, (3) rising of the dough, (4) shaping or molding into loaves or rolls, (5) rising of the loaves or rolls, and (6) baking.

MIXING. The first step in mixing is to soften the yeast by crumbling it into lukewarm water ($\frac{1}{4}$ cup at 82° F.) and letting it stand 5 to 10 minutes. This separates the yeast cells and they become active. Dry yeast becomes hydrated.

In making yeast breads, one may add the liquid to the flour or the flour to the liquid. Since different flours require different amounts of liquid, many cooks prefer to add the flour to the liquid so that they can stop adding flour when the dough is stiff enough to turn out on the board and knead. When milk is used as the liquid, it is scalded (heated to the boiling point) and measured into a mixing bowl. The sugar, salt, and fat are added to the hot liquid, which then is cooled to lukewarm. About a cup of the flour is added and beaten into the liquid. This helps to cool it to the proper temperature for the yeast (80° F.). Yeast cells are easily injured or even killed by too high a temperature. When the batter has cooled to 80° F. the softened yeast and the remaining flour are added gradually. The mixture is stirred until it is smooth and clings together in a ball, leaving the bowl clean.

KNEADING. This step accomplishes a thorough mixing of the flour and liquid, develops the gluten of the flour to make a network in the dough, and distributes the gas (leavening) produced by the yeast. Kneading consists of folding the dough over on itself and pushing it lightly in a rocking motion, then turning the dough and repeating these steps rhythmically until the surface of the dough looks smooth and feels satiny to the touch. The time for kneading varies with the kind of flour, hard-wheat flour requiring more kneading than soft-wheat flour. Eight to 10 minutes of kneading is an average time. When the dough is satiny and smooth, it is rounded into a ball, placed in a bowl, covered, and set in a warm place (80° to 85° F.) to rise.

Rising. The time necessary for rising depends upon the temperature, the amount of yeast, the richness of the dough, and the kind of flour. As the gas is produced by the yeast it is enmeshed in the tiny spaces between the strands of gluten. This gluten is elastic and stretches, and the dough expands until it is approximately doubled in bulk. Doughs from hard-wheat flours should increase to a little more than double; those from soft-wheat flours to a little less. It should rise until, when it is pressed gently with a finger, the impression remains. This requires from one and one-half to two hours, depending principally upon the amount of yeast used, provided other conditions are right. Cover carefully to prevent drying of the top.

Shaping. When the dough is ready for molding into loaves, it is turned onto the board, kneaded down, and divided into as many portions as there are to be loaves. Each portion is formed into a smooth ball. These may be covered with a towel and allowed to stand about 10 minutes, for best results. For the steps in shaping a loaf, see page 313.

The inexperienced cook may prefer to make plain rolls before undertaking loaves or fancy-shaped rolls. Parker House rolls are easy to make, the same proportions as for bread being used. The dough is rolled about a half inch thick, brushed with softened butter or margarine, and cut with a biscuit cutter. Each piece is folded over (buttered side in) into a semicircle and the edges are pinched together firmly. Then the rolls are placed on a greased baking sheet or in a pan.

Cloverleaf rolls are made by forming small balls of the dough of such a size that three fit into one muffin cup. Each ball is dipped into melted fat before being placed in the greased muffin pans. Cover the rolls and let them rise in a warm place (80° to 85° F.) until approximately doubled in bulk.

Baking. During baking, the gas in the dough expands, the gluten in the bread or rolls is set, the growth of the yeast is stopped, and the flavor of the bread is developed. The development of flavor comes from the cooking of the starch in the flour, the evaporation of some of the products of the yeast fermentation, and the changing of the surface starch to dextrins to form the brown crust.

The bread continues to rise in the oven for about the first ten minutes (somewhat less for rolls). This rising is called "oven spring." During this period, the bread or rolls should not brown if the oven temperature is right. This varies with the size of the loaf or rolls and the amount of sugar and other ingredients used.

Plain breads are best when baked at 400° to 425° F., and plain rolls at 425° F. Richer doughs and those high in sugar are baked at 350° to 375° F.

When loaves or rolls are done they shrink slightly from the sides of the pan, sound hollow when thumped lightly, and are an attractive golden brown. If rolls are to be reheated for serving, bake only to a very light brown.

Care after Baking. Rolls are best when served hot, as soon as they are baked. Bread

TABLE LV · *Proportions for Basic Doughs and Some Variations*[1]

Dough	Sifted Flour (All-Purpose)	Liquid	Leavening	Fat	Salt	Sugar	Additions	Method	Comments	Amount
Biscuits . .	2 c.	$\frac{1}{2}$ to $\frac{3}{4}$ c. sweet milk	2 to 3 tsp. b. p.	2 to 4 tbsp.	$\frac{1}{2}$ to 1 tsp.	0	0	Cut in fat	Bake 450° F.	4 to 6 servings
Sour-milk biscuits . . .	2 c.	$\frac{3}{4}$ to 1 c. sour milk	$\frac{3}{8}$ tsp. soda, $1\frac{1}{2}$ tsp. b.p.	2 to 4 tbsp.	$\frac{1}{2}$ to 1 tsp.	0	0	Cut in fat	Bake 450° F.	4 to 6 servings
Drop biscuits and dumplings . . .	2 c.	1 to $1\frac{1}{4}$ c. sweet milk	2 to 3 tsp. b. p.	2 to 4 tbsp.	$\frac{1}{2}$ to 1 tsp.	0	0	Cut in fat	Bake 450° F.	4 to 6 servings
Shortcake and rolled dumplings . . .	2 c.	$\frac{2}{3}$ c. sweet milk	2 to 3 tsp. b. p.	4 to 6 tbsp.	$\frac{1}{2}$ to 1 tsp.	0 to 2 tbsp.	0	Cut in fat	Bake 425° F.	4 to 6 shortcakes
Scones . . .	2 c.	$\frac{2}{3}$ c. milk, or cream, and egg	2 to 3 tsp. b. p.	4 tbsp.	$\frac{1}{2}$ to 1 tsp.	1 tbsp.	1 to 2 eggs, currants if desired	Cut in fat Egg to milk	Bake 425° F.	10 to 12 scones
Pastry . . .	2 c.	4 to 6 tbsp. cold water	Steam and air	$\frac{1}{2}$ to $\frac{2}{3}$ c.	1 tsp.	0	0	Cut in fat Everything cold	Bake 425° F. to 450° F.	2 crusts
Yeast bread or **rolls** . . .	2 c.	$\frac{1}{2}$ c. water or milk	$\frac{1}{2}$ cake compressed yeast	$\frac{1}{2}$ tbsp.	$\frac{1}{2}$ to $\frac{3}{4}$ tsp.	$\frac{1}{2}$ tbsp.	Egg may be added	Add flour to liquid or liquid to flour	Rise at 80°–85° F. Bake (rolls) at 425° F.	1 dozen rolls
Sweet dough	About $2\frac{1}{2}$ c.	$\frac{1}{2}$ c. milk	1 cake compressed yeast	2 to 4 tbsp.	$\frac{1}{2}$ to 1 tsp.	4 tbsp.	1 egg beaten		Bake 375° F.	1 tea ring or 18 sweet rolls

and rolls not to be served at once should be removed from the pans as soon as they are taken from the oven. Place them uncovered on wire racks to cool. If desired, brush the tops of hot loaves or rolls with fat. This gives them a tender crust and helps to keep them from becoming dry.

When thoroughly cooled, bread or rolls should be stored in bread boxes. Wrapping in waxed paper helps to preserve their freshness.

Standard for Bread. A good loaf of yeast bread or a good roll is symmetrical in shape, of good volume, and a rich, golden brown color, the top somewhat deeper brown than the sides and bottom.

The crumb (inside) of good bread or rolls is "silky" in appearance, uniformly creamy white in color, and has a reasonably fine even grain.

Good bread has a good wheaty flavor, though quite mild. Flavor and texture are so closely related in bread that they are often spoken of together as "eating quality."

For more details on the subject of bread-making, consult Chapter XXIII (page 310).

Table LV gives basic proportions for basic doughs and some of their variations.

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[1] *Boldface doughs* are basic doughs; others are variations.

XX · Flours and Meals

Flours are obtained by grinding cereal grains to powders of varying degrees of fineness. Meal is a coarsely ground flour. Flours differ from starches in that they contain other constituents of the grain along with the starch. Flours and meals are produced for use in making bread, pastry, and cakes. Those grains which yield flours most useful for these purposes are selected for milling.

Wheat is the preferred cereal for flour because of the presence in it of the two proteins, gliadin and glutenin, which unite in the presence of water to form gluten. This gluten is elastic, and allows the cells of batters and doughs to stretch as gas is released from the leavening agent. It hardens on heating and forms a firm cell wall which retains the shape of the inflated cell and helps to give form and lightness to the baked product. When the term "flour" is used without qualification, it means refined wheat flour.

Rye contains gliadin, the sticky portion of the gluten, but not glutenin. Rye flour doughs hold in the gas but lack the elasticity found in doughs made from the gluten-forming wheat flours. Rye flour yields a leavened but a heavier loaf than wheat flour. Only small amounts of rye flour are produced in this country. In northern Europe, rye is the chief breadmaking cereal.

Corn also contains gliadin but no glutenin. In the form of meal it is used extensively in making bread of a special texture and flavor. Buckwheat, oats, and rice, ground to flours or meals, are sometimes used with wheat flour in making breads and cakes of distinctive flavors and textures.

WHEAT FLOURS

Wheat flours vary in composition and qualities with the part of the grain and the kind of wheat or wheats used, and with the blending of the flour streams obtained at the different stages of the milling process.

Parts of Grain. In the discussion on cereal foods, it was shown that any cereal product varies in composition with the portion of the grain used. A diagram on page 89 shows the three parts of a grain of wheat. On the basis of the parts of the grain used, flours are designated as whole wheat and white flour. These are defined by the Food and Drug Administration as follows:

Whole-wheat flour, entire-wheat flour, graham flour, is the clean, sound product made by grinding wheat, and contains, in their natural proportions, all the constituents of the cleaned grain.

Flour, wheat flour, white flour, is the clean, sound, fine-ground product obtained in the commercial milling of wheat, and consists essentially of the starch and gluten of the endosperm. It contains not more than 15 per cent moisture, not less than 1 per cent nitrogen, not more than 1 per cent ash and not more than 0.5 per cent fiber.

The variations in the composition of these flours are shown in Table LVI.

Both whole-wheat and white flour are good sources of energy and protein. Whole-wheat flour contains slightly more protein and a better quality protein, more fat, and more ash than white flour. White flour has more starch and more of the gluten-forming pro-

Table LVI · *Composition of Wheat Flours*

	Water	Protein	Fat	Carbohydrates	Fiber	Ash	Fuel Value per Pound
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Calories*
Whole-wheat flour	11.30	13.30	2.30	69.10	1.9	1.8	1,628
Straight-grade white . . .	12.80	10.80	1.10	74.60	.2	.5	1,600

teins. Especially important nutritionally is the difference in the amounts of the B vitamins. The highly refined white flours, as milled at present, retain relatively small amounts of these important vitamins. All the vitamins in the grain are retained in the whole-wheat flour.

On the other hand, white flours have better keeping and breadmaking qualities than whole-wheat flours. When it is expedient to use white flour rather than whole wheat in breads, some of the differences in nutrient content can be made good by the use of other materials containing the minerals and B vitamins. The nutritive value of products made from flour depends not only on the composition of the flour, but also on the other ingredients. The use of milk solids and yeast in breads made from white flour helps to compensate for the nutrients removed in milling.

Kinds of Wheat. Wheat varieties are grouped as durum wheats, hard wheats, and soft wheats. These vary in the amount and character of the protein they contain. By appropriate selection and blending of varieties of wheat, six classes of flours are obtained that are adapted to special uses.

Classes of Flour. Flours are given class designations that indicate the use for which each serves best.

Macaroni flours, as the name implies, are designed for the making of macaroni and related products. They are milled from durum wheats, which are high in protein. Macaroni flours are quite granular to the touch and usually creamy in color.

Bread flours are milled from blends of hard spring and hard winter wheats. They are fairly high in protein and somewhat granular to the touch. They may be bleached or unbleached. Bread flours are milled primarily for bakers.

General-purpose, all-purpose, or **family flours** are of such composition that they may be used satisfactorily for all household cookery purposes. In the hard-wheat-producing areas, they are usually a blend of hard wheats. They are lower in protein content than bread flours, but they contain enough gluten-forming proteins for making good yeast breads, yet not too much for quick breads and cakes. In soft-wheat areas, all-purpose or family flours are usually a blend of soft wheats. Although both Northern and Southern all-purpose flours give good results in any type of product, the Northern variety makes especially good yeast breads, while the Southern variety is best for quick breads. Either of them gives good results in all types of home-baked products, except the lightest cakes. The latter are best when made with cake flour.

Pastry flours may be made of either hard or soft wheat although they are usually made of the latter. They are fairly low in protein, and are finely milled, though they are not so fine as cake flour. They are especially milled for making pastry and are used chiefly by bakers.

Cake flours are milled from soft wheats. They are short patent (see page 283), representing the most highly refined flour streams of the mill. The granulation is uniform and very fine, and the protein content low.

Flour Milling. The first flours made from wheat contained the whole grain. The grain was pulverized between two stones and the flour was used without sifting, or sifted by crude devices that removed only the lighter bran portions. Originally a household industry, the wheat was ground by the family as needed and storage life was not important.

As water wheels and windmills were developed to supply grinding power, milling became a community enterprise. Grinding stones were developed that broke the grain gradually instead of pulverizing it all at once. Methods were perfected for separating the different portions of the grain by sifting and bolting. These developments in milling produced a more highly refined flour with longer storage life, and mills were established that served large areas.

Now the whole milling process is highly developed. Steel rollers have been substituted for the grinding stones. The grain is run through rollers set at graduated distances apart. This breaks the grain gradually and makes possible quite complete separation of the bran and the germ portions from the endosperm, before the latter is pulverized to the fineness of a flour. This method of milling, known as the gradual-reduction process, is used in the manufacture of most of the wheat flour on the American and European markets. The product is white flour, of which there are many grades according to the method of milling and blending the numerous flour streams which result from the different stages of the milling process. Information on the steps in milling wheat is helpful in understanding the definitions of different grades of flour.

Cleaning is the first step in milling and an important one. All imperfect grains, weed seed, and any foreign material adhering to the grain must be removed before the grain is broken.

Breaking or **gradual reduction** is accomplished by passing the cleaned grain through a series of corrugated rollers at graduated distances apart. These rollers run toward each other, but one travels much faster than the other. The grains are held in the grooves of one roller while they are sheared off by the grooves of the other.

After passing through each set of rollers, the pulverized grain is sifted to separate the bran and the germ from the middlings, that portion of the endosperm which breaks into granular masses. The break flour, which is formed from the softer portion of the endosperm when the grain is broken, also is separated. The number of rollers varies, depending upon the size of the mill. The smaller mills may have as few as four or five rollers, while the larger mills have more. As the result of this gradual breaking and sifting the following products are obtained:

Bran, the cellulose portion with as much of the endosperm as may adhere to it.

Shorts, which contain the germ, some bran, and the adherent endosperm portion.

As many **streams of break flour** as there have been break rollers.

Middlings, the coarsely ground endosperm.

The final crushing of the middlings is accomplished by passing them through smooth rollers, and the flour from these reductions is collected in as many streams as there are smooth rollers.

Blending of the flour is accomplished by combining flours from the different streams. The first break flour comes from the softer portions of the endosperm and, therefore, contains a higher proportion of starch and a smaller proportion of the gluten-forming proteins than later ones. The flour from the last break stream has more gluten, but the gluten is poor in quality.

The flour streams from the reduction of the middlings contain more of the gluten-forming proteins. The first streams are of higher quality than those resulting from the later reductions, as the later ones contain some fibrous material. In some of the large mills there are as many as 40 streams of flour to be blended in preparing the various market grades of flour. Some of the smaller mills put out only one grade, the straight grade, which contains about 98 per cent of all the flour obtained.

Straight flour contains practically all the bolted wheat meal and may be designated as 100 per cent flour, or 98 per cent if the second clear flour is excluded. This represents from 70–72 per cent of the grain.

Patent flours are made up chiefly from the streams which come from the reduction of the middlings. They contain little or none of the streams of clear flour. Patent flours are designated as "long" or "short," depending upon how much of the total flour they contain. They may be designated on a percentage basis. For example, 85 per cent patent indicates a flour that contains 85 per cent of the total bolted wheat meal. The yield of high patent flour may be as low as 60 per cent of the weight of the wheat milled.

Clear flour contains the less desirable streams, that is, the less refined streams and the streams lowest in gluten content. Clear flour is divided into first and second clear on the basis of quality.

WARTIME FLOURS

During wartime, food supplies become increasingly important. Shipping is interfered with and locally produced food must be used to the maximum extent. Imported foods must be in a stable and concentrated form and used with great economy. Cereals are stable, concentrated, and ship easily. Wheat is in special demand because of the breadmaking quality of its flour, and must be used to produce as much flour as is consistent with the maintenance of a satisfactory quality of bread.

High-Extraction Flour. During the Second World War, England stretched the available wheat supplies for a time by an order requiring that 90 pounds of flour be produced from every 100 pounds of wheat milled. This flour was somewhat darker than flours of 70 to 80 per cent extraction, but still made good though dark bread. As wheat supplies became more abundant this requirement was reduced to 80 per cent, but in 1948 was increased again to 85 per cent.

While this step was taken in large part to save wheat, it was also in the interest of nutrition. The cereals, always important sources of the B vitamins, became the primary sources in Britain, as the result of the shortage of meat. The use of high-extraction flour saved wheat, the B vitamins, and other important food nutrients. The nutritive value of these flours is shown in Table LVII.

Studies in this country as well as in England have shown that flour from the secondary middlings and those from the end-streams and the final-break flours contain more of the B vitamins than the patent flours containing only the streams from the primary middlings. According to Bailey,[1] 80 per cent extraction flour contains one half the thiamine, two fifths the riboflavin, and one quarter the niacin content of the wheat from which it is made with the presently used methods of milling, whereas a 60 per cent extraction good-grade patent flour would retain only one tenth of the original thiamine and niacin and two tenths of the riboflavin. In this speech Bailey suggested the possibility that flour millers, who are custodians of much of the B factors in natural foods, would eventually find a way to adapt milling methods so as to transfer more of these vitamins from the grain to the flours they produce. Such a step would improve nutritive value of the flour with little if any loss in breadmaking quality.

In January, 1945, the British Ministry of Food, in collaboration with other depart-

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[1] C. H. Bailey, speech reported in *Chemical and Engineering News*, Vol. 42, p. 1059 (April 25, 1946).

TABLE LVII[1] · *Composition of Flour of Varying Extraction*[2]

Period	Extraction	Calories	Protein	Fat	Iron	Calcium	Thiamine	Niacin	Riboflavin	Fiber
	Per cent		*Gram*	*Gram*	*Milligram*	*Milligram*	*Milligram*	*Milligram*	*Milligram*	*Gram*
1940–March, 1941	73	342	12.3	1.8	1.4	14	0.09	0.9	0.05	0.10
March, 1941–April, 1942	75	342	11.8	1.3	1.4	15	0.12	0.9	0.06	0.15
April–September, 1942	85	340	12.3	2.2	2.4	21	0.33	1.9	0.17	0.70
October, 1942–December, 1943 .	85[3]	340	11.4	1.6	2.4	81	0.30	1.7	0.15	0.55
January–September, 1944	85[3]	340	10.7	1.6	2.1	76	0.29	1.7	0.13	0.50
October–December, 1944	82½[3]	340	12.6	1.6	1.9	79	0.26	1.8	0.10	0.31
January, 1945–February, 1946 . .	80[3]	340	12.0	1.4	1.6	73	0.24	1.6	0.08	0.21
March 1–15, 1946	82½[3]	340	11.6	1.5	1.9	79	0.26	1.8	0.10	0.31
March–May, 1946	85[3]	340	10.7	1.6	2.1	76	0.29	1.7	0.13	0.50
May–August, 1946	90[3]	330	13.0	1.9	2.8	86	0.33	3.6	0.14	0.90
After August 11, 1946	90[4]	330	13.0	1.9	2.8	148	0.33	3.6	0.14	0.90

ments, convened a conference to establish regulations which might have to be made with regard to flour and bread when wartime control ended. This conference reviewed the wartime experiences. It was apparent that the nutritive value of the wartime loaf had made an important contribution to the health of the British people, and it was hoped that the same nutritive contribution could be retained in the postwar loaf. The report[5] of this conference gives a good summary of the comparative nutritive value of high-extraction and enriched flours. This conference proposed a standard for flour in terms of thiamine, niacin, and iron. The amounts of these were stated at a level the group decided would provide in the postwar loaf the level of these three nutrients that bread might be expected to contribute to the British diet. The amounts are about half those required in enriched flour. (See below.) No standard was proposed for riboflavin, since wheat products are not important natural sources of this nutrient. The suggested amounts of thiamine, niacin, and iron can be obtained from flour milled to the 80 per cent level. The official scientific and medical members of the conference felt strongly that the retention of the natural constituents of the grain is preferable to the addition of a limited group of ingredients, since the flours of high extraction contains additional amounts of other important nutrients.

Enriched Flours. As a part of the nutrition program in the United States, a different approach was made to the flour problem. Wheat was abundantly available during the war period, and any change in the methods of milling seemed inadvisable at that time; so low-extraction flours were continued. Recognizing the deficiency of these flours in vitamins and iron, the Food and Nutrition Board of the National Research Council recommended that all white flours be enriched by the addition of not less than two milligrams of thiamine, 1.2 milligrams of riboflavin, 16 milligrams of niacin, and 13 milligrams of iron to each pound of flour. These requirements were incorporated in a definition for enriched flour issued by the Food and Drug Administration.[1] While the enrichment of flour was not and is not required by any Federal order, any flour labeled "enriched" must conform to the above definition. The millers generally complied with the enrichment program, and much of the flour on the market is still enriched. Some states have passed laws requiring the enrichment of flour.

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[1] Magnus Pyke, "Principles of Nutritional Rehabilitation," *Journal of American Dietetic Association 23*, No. 2, pp. 90–95 (February, 1947).

[2] Expressed per 100 gm. of flour. Data are given in terms of only two minerals and three members of the B Complex. Other minerals and B vitamins present in the wheat also are increased with the rate of extraction.

[3] $CaCO_3$ added.

[4] Increased $CaCO_3$.

[5] *Report of the Conference on the Post-War Loaf*, British Ministry of Food, His Majesty's Stationery Office, London, November, 1945.

Emergency Flour. Early in 1946, it became apparent that if the United States was to ship abroad the amount of wheat needed to prevent hunger in Europe, wheat must be used more economically. War-food order No. 144 issued in March, 1946, required that wheat used in flour milling be extracted at an 80 per cent level. In other words, the order required that 80 pounds of flour be produced from every 100 pounds of wheat milled instead of the customary 72 pounds. This flour was called "emergency flour" by the trade. It was slightly darker than 72 per cent extraction flour and required less water and mixing, and was higher in nutritive value than the lower-extraction flours. It was in some cases enriched with the amount of the specified ingredients necessary to bring it up to the standard for enriched flour. This order was repealed in November, 1946, when supplies from the new wheat crop became available.

QUALITY IN FLOUR

Flours are sold more on the basis of quality than of food value. Special qualities are needed in flours for different uses. The terms used to describe the more important qualities are "strength," "water absorption," and "color."

Flour Strength. "Strength" is the term used to describe the breadmaking power of the flour. Strong flours are desirable for yeast breads made in loaves and for popovers. For tender breads, cakes, and cookies less strong flours are more satisfactory. While many factors in the flour contribute to its strength, the most important is the amount and the kind of proteins present.

When flour is mixed with water to form a dough and kneaded, gluten is developed from the gliadin and glutenin present. This makes the flour form a dough and gives that dough elasticity. The starch can be washed out from a small portion of such a dough, leaving the gluten. If this ball of gluten is baked while still moist, steam is formed and the ball expands to many times its original size. As the baking continues, the gluten coagulates, or hardens, so that it retains its shape when cold. The amount and quality of the gluten formed are important to flour strength.

Flour strength is determined by standard baking tests, and measurements of the shape and volume of the resulting loaves. These tests show that other factors in the flour influence the quality and behavior of the gluten and so are important in flour strength.

The shape of the loaf depends upon the amount and especially the quality of the gluten. Gluten quality, that is, its cohesiveness, elasticity, and water-holding capacity, depends upon amounts and kinds of acids and minerals present in the flour, rather than upon any inherent differences in the gluten-forming constituents themselves.

The volume of the loaf is dependent upon gas formation and gas retention. Gas formation requires a sufficient supply of soluble carbohydrates and starch-splitting and sugar-splitting enzymes. These are generally present in all flours. The retention of the gas, which is apparently the more important factor in loaf volume, depends upon the elasticity of the gluten. The softer glutens allow the gas to escape, and the volume of the loaf is correspondingly smaller.

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[1] *Definitions and Standards for Food.* Food and Drug Administration. Federal Security Agency, No. 2, July, 1944.

Water Absorption. The water absorption of a flour varies with both the amount and the quality of the gluten. It is of interest to the baker, as an indication of the probable breadmaking quality and the amount of bread that will be obtained from a given weight of flour. Aging, up to a point, increases the water absorption of flour. Variations in water absorption account for the differences in the amounts of liquid to flour required to obtain mixtures of standard consistencies in home baking. Slight adjustments in amounts of liquid to flour may be required when changing from one flour to another of a different source, class, or grade, or when using flour from new wheat.

In changing recipes from hard-wheat to soft-wheat flour, one must remember that hard-wheat flour absorbs a larger proportion of liquid than soft-wheat flour. The basis for substitution cannot be given definitely, since the amounts will vary with the amounts of gluten present. A general rule is that 1 cup of hard-wheat flour minus 2 tablespoons is equivalent to a full cup of soft-wheat flour.

Color in Flour. Color in flour is largely due to the presence of a reddish-brown pigment in the endosperm of the wheat. Thorough cleaning of the grain before milling, combined with careful milling, and complete separation of all the bran products, will prevent dark color from other sources. The pigments naturally present in flours are unstable in character and break down when flour is stored for two or three months. In bleaching flour, chemicals are used to hasten these changes.

Color is largely an aesthetic quality, and in itself has no effect on the breadmaking quality. The Federal Food and Drug Administration requires that bleached flour entering interstate commerce be labeled "bleached" or "artificially matured."

QUALITIES OF WHOLE-WHEAT FLOUR

Whole-wheat flours lack strength and are high in color and retain the natural mineral and vitamin components of the wheat. They make heavy, dark, and flavorful loaves. While these flours contain the gluten-forming constituents, the percentage of gluten is less in the whole grain than in the endosperm portion used in milling white flour. Also, the high acid, mineral, and fat content of whole-wheat flours influences the quality of the gluten formed, and the bran particles interfere physically with gluten formation. The dark color in whole-wheat flour comes from the pigments that are abundant in the bran and germ portions of the grain. Bread made from freshly ground whole-wheat flour has a nutty flavor. Many consumers like its color and texture as well as its flavor.

In quick breads these flours can be used even more successfully than in breads leavened with yeast, though the resulting product may be heavier than the corresponding product made from the white flours. When a lighter product is desired, a mixture of white and whole-wheat flours can be used.

RYE FLOURS

Rye is more hardy than wheat and grows in cold climates. On account of its availability, it is the standard bread cereal in northern Europe. The composition of rye products is given in Table LVIII.

Bread made from rye flour has a close-grained texture because of the absence of one of the gluten proteins. Pumpernickel is the best-known rye bread. It is made from all rye flour fermented by the "sour dough" method. In this process the bread develops a special flavor, much liked by those accus-

Table LVIII · *Composition of Rye and Rye Flour*

	Water	Protein	Fat	Fiber	Carbohydrates	Ash	Fuel Value per Pound
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Calories*
Rye	10.77	12.26	1.58	2.08	71.42	1.92	
Rye meal	11.40	13.60	2.00	1.80	71.50	1.50	1,626
Rye flour	12.90	6.80	.90	.40	78.70	.70	1,588

tomed to it. Most of the rye bread on the market in this country is made from a mixture of wheat and rye flours.

CORN MEAL

Corn is the staple bread cereal for many families in the southern part of the United States. In energy value it compares favorably with wheat, but it is lower in protein content.

Milling Corn. In the milling of corn, that intended for use in bread is made into a meal. The evolution of the milling of corn has been quite similar to that of the milling of wheat. "Old-process corn meal" was prepared by grinding the whole grain, and corresponds to the whole-wheat flour. The first modification was the removal of a portion of the bran. This improved the texture of the meal and left in all the nutrients of the corn, but meal so milled had poor keeping quality, owing to high fat content of the germ portion. These meals became rancid if held too long, especially during the hot months of summer.

To obtain a meal with better keeping quality, the bran and the germ now are generally removed before the endosperm portion is ground. This produces a drier meal which contains less fat, more starch, and less flavor than the old-process meal. This new process or "degerminated" corn meal makes up a large amount of that now on the market, though the old-process or whole ground meal is still available from small local mills.

Fineness of Grind. Corn meal is ground to different degrees of fineness. If too coarse, it is difficult to cook thoroughly, while if too fine, it tends to settle and makes a heavy bread. It is especially important that bolted corn meals are not ground too fine. In unbolted meals, the particles of bran present absorb water, and prevent the meal from settling too much when cooked.

Composition and Nutritive Value. The composition of corn meals resulting from different milling methods is shown in Table LIX. In general, corn meals yield slightly more energy than wheat flour, but less protein and protein in a less efficient form. Most of the B vitamins *are removed in present-day methods of millings.*

Color of Meal. The table below shows no difference in the proximate composition of

Table LIX · *Composition of Corn and Corn Meals*

	WATER	PROTEIN	FAT	CARBOHYDRATES		ASH	FUEL VALUE PER POUND
				Not Fiber	Fiber		
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Calories*
Corn (whole-grain average)	10.80	10.00	4.30	71.70	1.7	1.5	1,795
Corn, white	11.40	10.80	5.00	68.80	2.5	1.5	1,690
Corn, yellow	11.90	10.70	4.80	68.90	2.2	1.5	1,690
Corn meal (O.P. unbolted)	12.00	8.70	4.70	71.10	2.2	1.3	1,850
Corn meal (O.P. bolted)	12.00	8.90	4.90	72.00	1.2	1.0	1,765
Corn meal (N.P. granulated)	12.50	9.20	1.90	74.40	1.0	1.0	1,770
Corn flour (N.P.)	12.60	7.10	1.30	77.50	.9	.6	1,650

the white and the yellow corn meals. Yellow corn meal, however, contains more vitamin A than white. This is in the form of the yellow pigment carotin. Certain other yellow pigments are present. Standards for enrichment of corn meal have been recommended by the Food and Nutrition Board, and enrichment is required in certain states.

Bread from Corn Meal. In using corn meal in the preparation of any of the breads, four facts should be borne in mind: (1) It contains no gluten. (2) It is heavier and requires a larger proportion of liquid per unit of measure than wheat flour. Also corn starch takes up more water than wheat starch when gelatinized. (3) The amount of water necessary can best be combined by cooking the meal to a thick mush before making it into a batter. This improves the flavor of the bread and prevents the meal from settling out, as it would in a batter containing sufficient liquid and raw meal which contains no gluten. (4) Corn meal cannot be used in doughs successfully, except in combination with wheat flour. Used in this way, it changes the texture of the flour mixture but loses its own identity in the process.

Typical corn bread is made with a combination of meal, salt, and water. In early days this mixture was baked in ashes, and so was designated as ash cake. The present-day modifications are baked on a hot griddle as a hoe cake, and in the familiar oblong shapes, for Southern corn pone. In these, the leavening agent is steam, and the bread is light when eaten hot. When cold it becomes soggy and heavy, unless a special texture results from the coarseness of the corn meal.

This simple form of bread is modified and made more porous by the addition of chemical leavening agents: baking powder and soda and sour milk. To prevent these breads from falling when they become cold, egg is sometimes added to give some rigidity to the cell structure. Egg corn bread is really a muffin mixture in which corn meal is substituted for wheat flour.

Yeast bread is rarely made from corn meal. Meal may be substituted for a portion of the wheat flour, but in such bread the corn is not an identifying feature. In breads of this sort it is best to cook the corn meal before adding it to the dough.

It is difficult to give exact proportions of corn meal to be used with a given amount of liquid, since the corn meals differ widely, with the method of milling. Unbolted meal requires slightly less liquid than the new-process meal, since it contains less starch.

OATS

Oats have been used very little as a bread cereal, except in Scotland. There the oatcake is a favorite article of diet. Oat flour can be used in the preparation of bread in the same way as corn meal; and it can be substituted for some of the wheat flour in other breads with very satisfactory results as to flavor. Rolled oats may be used in muffins.

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XXI · Leavening Agents

A leavening agent is any substance in flour mixtures which makes the cooked products porous or light. Most breads, cakes, cookies, and pastry are leavened. A few breads, usually cracker-like, such as ship's biscuit or hardtack, are unleavened. The advantage of these compact products is that they do not dry out.

In leavening the various flour mixtures, a gas, or some substance which will form a gas, is distributed through the batter or dough. During baking, this gas expands and makes the mixture light. Then the heat cooks the starch and coagulates the protein of the flour or egg or both and sets the product so that it remains light.

In some cases, the gas formed comes from one of the essential ingredients. In others, it is formed by a chemical reaction which takes place as the result of an added ingredient. In still others it is due either to a fermentation resulting from an added ingredient, or is the result of a special manipulation of the ingredients.

The temperature used in baking bears an important relation to the kind of leavening used. In some cases heat affects the release of the gas and in all cases it expands the gas in the mixture.

KINDS OF LEAVENING AGENTS

Leavening agents may be classified as follows: Physical leavening agents, which include air, steam, and occasionally other volatile substances; chemical leavening agents, including baking soda used with acid, and baking powder; and organic or biological leavening agents, including yeast and gas-forming bacteria.

Air as Leavening. There are several ways in which air may be incorporated in flour mixtures: by using egg-white foam (beaten whites); by creaming fat and sugar; and, to a lesser extent, by repeated sifting of the flour or by beating the mixture. The air thus entrapped expands when the mixture is heated and leavens or helps to leaven it. It is necessary to bake products leavened entirely with air comparatively slowly, so that a crust will not be formed over the top before the air has expanded.

EGG-WHITE-FOAM. Egg white is one of the best mediums for incorporation of air. Its viscosity is such that its volume may be increased several times by the amount of air that can be entrapped in it. The yolk differs in composition from the white and will not hold air in the same way. Consequently when addition of air is desired, the two portions of the egg are beaten separately. This method of leavening is always used in the typical sponge cakes, and to some extent in cakes made with fat.

CREAMING FAT AND SUGAR. The creaming of fat and sugar in cakes made with fat incorporates air and helps to leaven the product. Pound cake, the richest of the cakes, depends in part upon air incorporated during creaming for its leavening.

SIFTING THE FLOUR. Sifting the flour introduces some air into the mixture. A measure of the amount of air that is introduced in this way may be obtained by observing the differences in bulk of a cup of flour after repeated siftings. Flour should always be sifted once before measuring. After two or three siftings, so little air is introduced that any further sifting is hardly justified.

Beating Flour Mixtures. Air may be incorporated directly into a batter if the batter has an elastic texture due to the presence of a large proportion of gluten or egg. This method is rarely used as an exclusive means of leavening. It is of value, when used in addition to creaming, in pound cake, where a smooth, even, not especially light texture, is desired.

Beaten biscuits contain no added leavening. Their texture is due, in part, to air incorporated by folding and beating. The old rule was to "beat them until they blister."

Steam as Leavening. In practically all batters and doughs, a certain amount of liquid is volatilized and helps to leaven the mixture. Where the proportion of liquid is high, as in popovers and cream puffs, steam is the only leavening agent. Mixtures leavened only by steam require a hot oven to raise the liquid to the boiling point very quickly. Such mixtures are characterized by large central cavities, in the case of popovers and cream puffs made from batters, and by a decided increase in volume in both batters and doughs. Steam has great leavening ability, since water increases in volume many times in changing from liquid to steam. Pastry is the typical dough leavened by steam.

Carbonated water was used at one time in England in the preparation of so-called aerated bread. This bread was made by mixing the dough under pressure with charged water. When the pressure was released, the dough expanded. Further expansion occurred when the bread was baked.

In dilute form, alcohol may be used as an aid in leavening. It volatilizes at a low temperature, forming a gas that may help to leaven certain mixtures. The brandy and other alcoholic beverages used in fruit cake, plum pudding, and pound cake are primarily for flavor, yet there is some leavening effect from them.

Baking Soda. All chemical methods of leavening depend upon the liberation of carbon dioxide from a carbonate by the use of an acid. The carbonate used is the so-called "baking soda" or sodium bicarbonate. The chemical methods of leavening are simple and easily controlled even in the hands of the inexperienced, but they do not develop flavor in the dough as the fermentation methods do, and they leave a residue which in some cases may be undesirable. In general, the chemical action which produces leavening may be illustrated by the following equation:

Soda + acid = carbon dioxide + a residue
salt + water

Probably the simplest of the chemical means of leavening are those in which soda is used in combination with some acid liquid ingredient. It is important in using soda to know just the amount to add, for not only is an excess of soda unpalatable, but it decreases somewhat the vitamin content of the foods.

Sour milk and buttermilk are the acid-containing liquids most used for chemical leavening. The acid in both is the same, lactic acid. In the souring of milk the lactic acid is formed from lactose. After eight per cent of lactic acid has been formed, the lactic-acid fermentation stops. This is indicated by the fact that the content of lactose remains constant. On this basis and also by neutralizing carefully measured volumes of sour milk, it is found that the amount of soda necessary to neutralize each cup of milk is 8.36 grams, or, in household terms, a scant half teaspoon.

When fruit juice is an ingredient of a batter or dough, soda may be used to produce carbon dioxide. Also the acid of cut-up fruit in cakes and cookies will combine with soda to form some carbon dioxide.

Sirups contain varying amounts of acid which may be used to release carbon dioxide from the soda in mixtures such as gingerbread, brown bread, dark cakes, and cookies normally containing molasses or other sirup. The percentage of acid in true molasses is higher than that in sour milk, but the acid content in molasses is more variable. It is well to know the acid value of the molasses before using it in combination with soda in flour mixtures. One-half to one teaspoon of soda is used to each cup of molasses. The variations from this amount with the different kinds of sirup are shown in table below.

Table LX · *Amount of Soda to Neutralize Acid in One Cup of Sirup*

Sirup	Amount of Soda
	Teaspoon
Corn sirup	¼
Honey	¼ to ½
Molasses	½ to 1
Sorghum	½ to 1

In substituting another form of sirup for molasses, it is necessary to make the correction indicated in the amount of soda called for, and to add baking powder to complete the leavening; or to add the amount of soda called for, and make up the acid deficiency by the addition of some other form of acid.

Sorghum often is less acid than molasses, but it may be just as acid.

Honey usually contains a sufficient amount of acid to make it of value in the liberation of carbon dioxide from soda. Just as with other sirups, the acidity varies with honey from different sources.

Corn sirup is usually lower in acid than the other sirups and, therefore, soda usually is omitted when it is used. In recipes calling for both molasses or other sirup and sour milk, the acid content of the two should be considered in determining the amount of soda necessary.

Cream of tartar is an acid powder that formerly was used in the household with soda as a means of leavening. At present it is little used for this purpose except in commercial baking powder, where it has been carefully weighed and mixed.

Baking Powders. Commercial baking powder was unknown a hundred years ago. Today it is consumed in the United States at the rate of more than a pound per person each year. All baking powders are combinations of an acid powder and baking soda in such proportion that they combine to form a salt. The carbon dioxide contained in the soda is given off in the batter or dough. In commercial baking powder, an inert filler or stabilizer is added which serves a double purpose: (1) to keep the two active ingredients separated mechanically and to absorb any moisture, thus preventing the reaction of the powder in the can; (2) to serve as a filler. All baking powders are made up to yield a standard amount of carbon dioxide; so the weight of the soda is constant (approximately 25 per cent). The weight of the different forms of acid required to release the carbon dioxide varies. In standardizing the powders, these differences in weight are made good by the amounts of inert filler added. In most baking powders the stabilizer is cornstarch, but in certain types of powder, calcium carbonate is used in addition to cornstarch. It is probable that such a baking powder which supplies calcium to the food baked with it may be of value nutritionally.

Two teaspoons of baking powder contain approximately ½ teaspoon of baking soda. It is required by law that all commercial baking powders contain the essential constituents in such proportion that the powders yield not less than 12 per cent available carbon dioxide gas. While the various brands of baking powders may differ in strength, few, if any, are manufactured to yield less than 13 per cent or more than 18 per cent by weight of available carbon dioxide.[1] Most powders yield about 14 per cent carbon dioxide when fresh. This means that 100 grams of baking powder will release approximately 14 grams of carbon dioxide. The price of baking powder is no measure of its leavening ability, but is based on the cost of the acid ingredient.

Kinds. The variable ingredient in different baking powders is the acid. There are three general kinds of powders, depending upon the kind of acid they contain. Each powder is named according to its acid-reacting component. These are:

1. Tartrate Powders, or those in which the acid is in the form of cream of tartar, or cream of tartar plus tartaric acid. There are at least two well-known brands of this kind of powder. These are quick-acting baking powders.

2. Phosphate Powders, or those in which the acid component is an acid phosphate of calcium. There are two modifications of this kind of powder. Two old well-known brands belong to one modification, which contains the hydrate of monocalcium phosphate and is comparatively fast-acting. The other modification is fairly new. The acid is in a less-soluble form of the monocalcium phosphate and so liberates gas more slowly than the original phosphate powders.

3. Sodium Aluminum Sulphate Powders, often called S.A.S. baking powders, or those containing two acid components—hydrate of monocalcium phosphate (the same as the phosphate powders) and sodium aluminum sulphate. The latter ingredient is not an acid, but it forms an acid by the addition of water. This hydrolytic process is slow and incomplete in the batter or dough until the mixture is heated. These powders, therefore, are double-acting and are designated in that way, one reaction taking place in the cold, the other during cooking. This type of baking powder is widely distributed.

As has been indicated, these three kinds of baking powders behave differently in flour mixtures, giving off carbon dioxide at different rates. For this reason they should be used in different proportions and also handled differently. With tartrate powders, which are rapid in reaction, much of the gas may be formed during mixing. As much as 90 per cent of the gas may be liberated at room temperature. This means one must work rapidly when using this kind of powder.

On the other hand, the S.A.S. powders are slowest in reaction and must be heated before the reaction is complete. When these powders are used there is no special need for haste; in fact, the batter or dough may be made up beforehand and held until time for baking.

Table LXI compares the three kinds of baking powders as to acid components, rate of reaction, and average amounts to use to each cup of flour. Good results can be obtained with all kinds of baking powders if each is properly handled.

Yeasts for Leavening. Yeasts are microscopic one-celled plants which multiply by budding. When alive and active these tiny organisms are able to ferment or break down sugar with the liberation of carbon dioxide. The steps in the fermentation are indicated as follows:

Starch + diastase (enzyme in flour) + water
= dextrins + maltose
Maltose + maltase (enzyme in flour) = glucose
Glucose + zymase (enzyme from yeast)
= alcohol and carbon dioxide

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[1] Available carbon dioxide is the amount of carbon dioxide liberated from the baking powder under mixing and baking conditions, and is that part which accomplishes the actual leavening.

Table LXI · *Comparison of Different Kinds of Baking Powder*[1]

Kind	Acid Component	Reaction Rate[2]	Approximate Amount for 1 Cup Flour	Comparative Oven Temperature[3]
			Teaspoons	
Tartrate	1. Cream of tartar or	2	1½ to 2	Higher
	2. Cream of tartar + tartaric acid	1	2	Higher
Phosphate	1. Monocalcium phosphate, hydrate or	3	1½ to 2	Higher
	2. Monocalcium phosphate, anhydrous	4	1 to 1½	Lower
Sodium aluminum sulphate or combination	Monocalcium phosphate + sodium aluminum sulphate	5	1 to 1½	Lower

The carbon dioxide so liberated is retained by the gluten of the bread, or other batter or dough. The leavening is in proportion to the amount of gas so formed and retained. The alcohol is driven off during baking and probably contributes somewhat to the leavening.

Leavening bread by fermentative changes is the oldest method known and is still the method in most general use throughout the world. This was at first a more or less haphazard method and was controlled only indirectly by changing the conditions under which the bread was mixed and raised. With the development of the science of microbiology and the study of the microorganisms in relation to their application in breadmaking, the fermentation of bread has been worked out as a very definite and exact science. The most desirable yeasts have been isolated and studied in detail. They are now available in fairly pure cultures. Furthermore, the process of making yeast-leavened breads can be controlled and the conditions provided under which the yeast will develop best.

Yeast is available to the consumer as moist or compressed yeast and as dry yeast. Compressed yeast comes in cakes and dry yeast in granular form in envelopes or packages.

Compressed Yeast. Compressed yeast contains active living yeast cells. It is put up in the form of cakes composed of millions of these cells. In the preparation of the cakes, the well-washed yeast is mixed with a small amount of starch, pressed, and cut into cakes of the desired size. The cakes are wrapped in tinfoil and kept under refrigeration until distributed for use. The amount of starch that is added varies somewhat. Its use is justified on the ground that a better cake is formed than from the yeast cells alone, and that the starch acts as a drier, making the yeast keep better. Twenty per cent is usually considered the limit of the amount of starch used in compressed yeast.

A fresh cake of compressed yeast should have a creamy color with a grayish-brown tint. It should be only slightly moist, uniform throughout, should have fine even texture, and should break with a clean fracture and a faint "click." Any dark or streaked color indicates incipient decomposition. The odor should be pleasing, somewhat suggestive of an apple. The flavor should never be acid or cheesy. If held for too long a time or at too high a temperature, the yeast gives an undesirable flavor to bread and the yeast cells may be so far destroyed as to be ineffective in leavening the bread.

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[1] By reading the label on the can one can identify the kind of powder.

[2] The figures 1 to 5 indicate the rate of reaction. One is the most rapid and 5 is the slowest.

[3] A slightly lower oven temperature may be used for those powders which work most slowly. (See page 303.)

The advantages of the use of compressed yeast are that, if fresh, it is more certain in its action and the action takes place faster than if some other form of yeast is used. The disadvantage of its use is that it does not keep well. It should be kept in the refrigerator, where it may be kept about a week.

Dry Yeast. Dry yeast is available in two forms—one is inactive, the other the comparatively new active or "quick rising" form. The inactive dried yeast cakes containing corn meal keep longer than any other form of yeast. Either of these forms may be kept without refrigeration.

In the preparation of dried yeast cakes, the yeast cells are mixed with corn meal, a food-yielding substance of a drying character. The mixture is then pressed into cakes, cut into appropriate sizes, and dried. Since the yeast cells are in an inactive state, it takes a longer time to make bread from them than from active yeast cells. The inactive cells must be given opportunity to develop and take on the active form. When these yeast cakes are soaked in a small amount of warm water containing a little sugar, the yeast becomes active again and bread may be leavened from it. It is less certain in its action, however, and requires more time than either compressed or quick-rising dry yeast.

Several brands of the fast or quick-rising dry yeasts are on the market. This granular form of yeast is packaged in amounts corresponding to a cake of compressed yeast. While this dry form of active yeast does not remain active indefinitely it does keep longer than compressed yeast and without refrigeration. Usually each package carries a date and directions, "For best results use before ——."

Home-Grown Yeast. In the old days before yeast was available in commercial form, women grew yeast at home, seeding a nutrient batter with wild yeast from the air, the utensils, or the material used in making the batter. If this batter was held under appropriate conditions, any wild yeast present would grow and the mixture would become foamy and spongy. Such a mixture was called a starter. Some farm women still make a starter, but usually they seed it with commercial yeast.

Potatoes, water, sugar, salt, and sometimes hops make a nutrient solution in which yeast will grow. The hops help to eliminate undesirable fermentation and also contribute to the flavor. Salt, too, helps to control the fermentation and improve the flavor. When such a mixture is seeded with yeast (wild or commercial), the yeast cells multiply, give off carbon dioxide, and the batter becomes foamy. This starter is used in making the sponge (see page 314) for bread and rolls. Then some of the sponge is saved, and used to seed a starter for the next breadmaking. Yeast starters must be stored in refrigerators, and even then bacteria may develop which give the bread a bad flavor. In this case, a new starter has to be made with fresh yeast.

Favorable Conditions. Since yeast is a living organism, the conditions under which it will grow best are very important if it is to be used successfully to leaven bread. First of all, yeast must have food and, if the cells are to multiply, this food must contain certain essential nutrients. Yeasts lose their activity if grown for too long a time in a pure carbohydrate solution. They must also have an adequate supply of water. They will grow in a mixture of the consistency of dough, but are more active if the mixture is moist like a batter. On that account, bread is frequently started in the form of a sponge in order to accelerate the action of the yeast cells. The activity of yeast cells is best when the temperature is between 80° and 85° F. Below 70° F. the action is slowed down, and above 90° F. the growth of bacteria inhibits the growth of the yeast cells. High temperatures kill the yeast cells.

The amount of yeast to use is determined, in the home, by the length of time available to make the bread or rolls. An average amount is one cake of compressed yeast, or its equivalent, to about a pound of flour. Extra yeast speeds the fermentative changes. Bakers commonly use from two to three per cent yeast, although the amount may be more or less than this.

Bacteria for Leavening. Other microorganisms which may be used for leavening bread are certain harmless gas-forming bacteria. These are used to leaven the so-called salt-rising bread. The name of this bread has come from the custom of adding salt to the sponge, presumably to inhibit the growth of certain undesirable organisms. The bacteria leaven the bread by breaking down certain of its ingredients, principally the sugars, forming gaseous products, about two-thirds hydrogen and one-third carbon dioxide. Yeast produces no hydrogen.

These bacteria are found frequently in cornmeal. They are peculiar in that they lose their gas-producing power if kept in a moist condition, and must be kept dry if they are to survive for any length of time. These bacteria are very resistant to heat because they are in the spore state. This accounts for their survival in the ordinary method of making salt-rising bread in which scalded milk is poured over the corn meal. They grow best at a temperature some 20° to 25° F. higher than yeast, the optimum temperature being somewhere between 105° and 120° F.

Milk is an essential ingredient of the bread made in this way, while the necessary constituent of the milk seems to be the casein. Casein and lactose (milk sugar) are more effective than casein alone.

It is possible to obtain dried cultures of the bacterial ferment for making salt-rising bread. While the commercial ferment is a combination of bacteria and does not contain any yeast, it is generally known as "salt-rising yeast." It is not on the market in amounts suitable for most homemakers. It is sold in two-and-one-half-pound bags and larger. Very little is needed to make bread in quantities suitable for the home. Bakers use this ferment according to a definite formula and their results are as certain as when yeast is used. There is no reason why the making of salt-rising bread in the home should not be as easy as the making of yeast bread if the ferment were available in small amounts. Most homemakers, however, do not care to make this bread often and it is available at most bakeries.

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XXII · Cakes Containing Fat

There are at least two groups of cakes: sponge cakes, which contain no added fat, and cakes with a high percentage of fat. Sweet or dessert breads leavened with yeast might make a third group, although these are more often considered variations of yeast bread.

Sponge cakes already have been considered. This chapter deals with those cakes which contain added fat. Such cakes are sweet, rich muffin mixtures. This means that proportions for cake are built on those for muffins, with more sugar, more egg, and more fat than muffins.

INGREDIENTS OF CAKES

The basic ingredients for the cakes of this group are the following: flour, liquid, sugar, eggs, fat, leavening, salt, and flavoring.

Flour. A soft-wheat or cake flour is best for cake. There are many brands of special cake flour on the market but any soft-wheat flour may be used. If bread flour is used the amount should be modified in accordance with the suggestion on page 286.

Liquid. The liquid in cake is usually sweet milk, although sour milk may be used. When sour milk is used it may be depended upon to help leaven the mixture provided soda is used in proper amounts. Water may be used in place of milk with equally good results as regards the texture of the cake, but the food value is less than with milk. Fruit juice is sometimes the liquid used, especially in fruit cakes.

Sugar. Granulated sugar is the form most frequently used. Weight for weight of well-sifted brown sugar may replace the white, except in white cakes. Sirups may be used for part of the sugar. Honey gives a pleasing flavor, and cakes made with it remain moist longer than those made with most other forms of sugar. All sirups increase the specific gravity[1] of the batter and tend to make the cake heavy. In general, a cup of ordinary sirup or honey is equivalent to a cup of cane sugar, for although the sirup contains only about 75 per cent sugar, a cup of sirup weighs sufficiently more than the sugar to make good this difference. The more accurate method is to weigh out the required amount of the sirup, taking into account the composition of the sirup in terms of sugar. (See page 31.)

Neither corn sirup nor corn sugar is very satisfactory in cakemaking, since if enough is added to sweeten the mixture it tends to make the cake heavy.

Eggs. It is difficult to find a substitute for eggs in cake. Eggs are needed to make the cell walls firm so that the weight of the sugar will not cause the cake to fall. The amount of egg called for can sometimes be decreased by proper adjustment of the other ingredients. But when cakes are made entirely without eggs, or some ingredient which acts similarly to egg, the fact is usually apparent. Soy products are being used to replace egg in some cake mixes.

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[1] Relative weight compared with the weight of an equal measure of water.

Fat. Butter and cream were formerly the fats used almost exclusively in cakemaking. This was because they were readily available and their flavor is desirable where a large percentage of fat is used. Increase in the price of these fats has brought about the use of less expensive fats. Any fat with a desirable or a bland flavor may be used even in the plain white cakes. In cakes containing spice or chocolate, practically any of the fats used in cookery will be satisfactory. The fats with good creaming quality, such as butter, hydrogenated fats, and margarines, in general, give better texture and volume in cakes than fats with poor creaming quality. Refined lards make good cakes, and with certain methods of combining, the bland oils may be used. Many basic recipes call for butter or other table fat. When other fats are used in place of butter, the amount may be decreased about 2½ tablespoons per cup.

Leavening. Air may be incorporated in the egg white by beating separately, and in the fat by creaming. Pound cake, however, is the only cake containing fat to which no other leavening is added. In addition to the incorporated air, a chemical leavening agent generally is used. This is most often baking powder but may be soda with an acid-containing liquid. When the eggs are not beaten separately, it is sometimes necessary to use more baking powder.

Salt and Flavoring. Salt is essential to the flavor of cakes. The amount added depends mainly upon the fat, whether it is salted or unsalted. The flavoring liked best in cakes is vanilla, although other extracts, fruit juices, chocolate, and spices may be used. While salt and flavoring are important, the palatability of a cake depends, to a large extent, upon the quality of the basic ingredients and their proportions.

BASIC PROPORTIONS

Proportions for cake must be developed so as to obtain a product that is of pleasing sweet flavor, tender, and light. The sugar contributes the sweetness; the tenderness is affected by both the sugar and the fat; and the eggs and the fat give the richness characteristic of cake.

In beginning with a muffin recipe, one adds sugar to give the desired sweetness. When this is done the specific gravity of the mixture is increased to such a degree that the product would tend to fall if the cell walls were not strengthened by additional egg, flour, or both. As the egg is increased, the fat, too, should be increased to make the product tender.

When the ingredients are numerous, as in cake, many variations are possible. The number of recipes is unlimited, especially when all the ingredients are varied. However, if one ingredient is kept constant it may be seen that the variation is not so great as the number of recipes would indicate. In order to compare recipes, all the ingredients should be expressed in terms of one as a basis, and flour seems to serve this purpose best. Three cups flour make a large cake but one in which the proportions are easily divisible into halves or thirds to suit the needs of a small family. If all cake recipes are changed to the same amount of flour, the real limits of the proportions can be seen and a basis can be formed for working out the interrelation among the amounts of the different ingredients.

Comparison of Recipes. Table LXII shows some typical recipes summarized on this basis. There are many possible variations among these proportions, but, in general, very small differences have little effect on the texture of the cake.

Limits of Proportions. Other than pound cake, the richest of all cakes, the limits of proportions for cakes of this group, using 3

Table LXII · *Proportions of Typical Cake Mixtures*

	Flour	Liquid	Sugar	Eggs	Fat[1]	Baking Powder	Salt
	Cup	*Cup*	*Cup*	*Number*	*Cup*	*Teaspoon*	*Teaspoon*
Sweet muffin	3	1½	⅓	1½	⅓	3 to 6	1½
Basic cake	3	1	1½	2 to 3	½	1½ to 3	1½
1-2-3-4 cake	3	1	2	4	1	1	1½
Pound cake	3	0	1½	6	1½	0	1½

cups flour, are these: ¾ to 1½ cups liquid, 1 to 2 cups sugar, ¼ to 1 cup fat, and 1½ to 4 eggs.

In using these amounts, the following general rules governing the interrelation of the proportions should be observed.

The sugar should never be increased beyond the amount of 2 cups for 3 cups flour, When as few as 2 eggs are used, the sugar should be decreased to 1½ cups. Cakes with too much sugar fall in the center where the weight to be supported is greatest. These cakes exude fat and give the impression that the falling is caused by the presence of too much fat rather than too much sugar. This is probably due to the fact that the presence of so much sugar prevents the starch from being hydrolized, as it would ordinarily, so that it does not hold the fat nor does it strengthen the cell walls.

An increased number of eggs makes it possible to add more sugar. This is due to the fact that eggs strengthen the cell walls and make it possible for them to hold up the greater weight.

As the fat is increased, the eggs must be increased. Fat tends to weaken the cell walls and egg strengthens them. The following relations work well between the egg and the fat in a standard cake using three cups flour:

Eggs	*Fat*
1½	⅓ cup
2	½ cup
3	¾ cup
4	1 cup

As the eggs and the fat are increased, the liquid must be decreased or the mixture will become too soft and the cell walls will not become firm during baking. When the fat is no more than 1 cup and the number of eggs does not exceed 4, 1 cup liquid gives good results, probably because of the relation between the sugar and the liquid. If the eggs are increased beyond 4, the liquid should be decreased to ¾ cup.

In pound cake,[2] in which 6 eggs are used, no other liquid is added. In this case, the amount of fat is large (1½ cups) and decreases the necessity for liquid. The texture of pound cake is quite different from that of the other cakes in this group.

Checking Recipes. From what has been said, it may be seen that it is possible to tell whether a cake recipe will work before making a baking test. The proportions of the ingredients should conform, in general, to the following basic rules:

1. Sugar should not exceed ⅔ of the measure of the flour, and in most cases ½ is safer.

2. There should be at least 2 eggs if the fat is as much as ½ cup; 3 eggs for ¾ cup fat, and 4 eggs for 1 cup fat.

3. The liquid should be approximately ⅓ the measure of soft-wheat flour; when less than 2 eggs and ½ cup fat are used, the liquid is increased.

Variations in Cake. There are endless variations in cake. As has been seen, the basic ingredients may be varied within wide limits, from a very plain cake, resembling muffins, to a very rich one, such as pound cake.

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[1] Unsalted fat.

[2] Pound cake gets its name from the fact that, in a larger recipe than the one given here, there is one pound of each of the essential ingredients: flour, sugar, fat, and eggs.

There are other ways to vary cake to obtain entirely different results. One is the part of the egg which is used:

Gold cake is made by using all yolks, double the number of whole eggs called for. The milk and leavening may need to be increased slightly.

White cake is made from all whites, substituting the same measure of whites for whole egg.

Other variations include these:

Spice cake is made by adding ½ teaspoon cinnamon and smaller amounts of other spices, such as nutmeg and clove, to each cup flour. The simplest method of combining the spices with the other ingredients is to sift them with the other dry ingredients. Some authorities suggest combining them with 1 tablespoon boiling water, then adding them to the batter.

Fruit cake usually is spiced, and contains chopped dried fruits and nuts. These are combined with part of the flour, and added last.

Chocolate cake is made in various ways and with either cocoa or chocolate. The simplest proportions are to substitute 2 tablespoons cocoa for 2 tablespoons of each cup of flour called for. An equivalent amount of chocolate may be used. It is melted over hot water or over low heat and added with the fat.

Chocolate cakes vary considerably in color from light brown to dark brown and deep mahogany-red. The quantity and kind (see page 344) of cocoa or chocolate affect the color of chocolate cakes. The kind and amount of chemical leavening also affect their color. Any baking powder that leaves an acid residue tends to give a grayed effect. Red chocolate cake, known as "devil's food," is alkaline in reaction, usually as the result of an excess of baking soda in the recipe. This excess of soda would be objectionable in flavor if it were not covered by the chocolate. Even so, an excess of soda in chocolate cake destroys to some extent the distinctive chocolate flavor. For this reason, a rich-brown chocolate color is preferred to the mahogany-red by most of those who understand the reason for the red color.

METHODS OF COMBINING

There are three general methods of combining the ingredients for cakes containing fat. These are as follows: (1) the muffin method, (2) the so-called conventional method, and (3) the new speed method, called by various terms. Each of these totally different methods produces a different type of finished product, and the cakemaker may choose the method she prefers.

Each of the basic methods has a number of variations. The basic methods and some variations are discussed here.

Preliminary Steps. There is certain preliminary preparation to the making of a cake that must be carried out regardless of the method of combining the ingredients. One of the most important factors, for best results, is that all ingredients should be at room temperature (70° to 75° F.). The fat used should be soft, but not melted. Eggs beat to greater volume at room temperature than at refrigerator temperature.

The oven should be at the specified temperature for baking before the cake is put into it. Therefore, the oven should be turned on before the cake is mixed, so that it can be regulated by the time the cake is ready.

The pan or pans should be ready for the batter before the ingredients are combined. There are two ways of doing this for cakes made with added fat:

1. Greasing the bottom of the pans, using the same fat as that used in the cake, then dusting with flour.

2. Lining the bottom of the pans with waxed paper, cut exactly to fit the bottom.

As mentioned before, flour should always be sifted once before measuring. This should be done just before making the cake.

All ingredients must be measured (or weighed) accurately before combining them is begun. Use standard measuring utensils and level measurements, scraping them off level with the edge of a spatula. It is best to measure eggs in a measuring cup, unless they are graded for size and the volume is known. Eggs vary in size. (See page 98.)

Cakes may be combined in an electric mixer or by hand with a two-quart mixing bowl and a wooden spoon.

Muffin Method. The simplest method of combining the ingredients for a cake is the muffin method. As the name implies, it is the same as that generally used in making muffins and consists of three main steps: (1) sift the dry ingredients together: flour, leavening, sugar, and salt (with self-rising flour the leavening and salt are omitted); (2) combine the liquid ingredients: milk, beaten eggs, flavoring, and melted fat; and (3) add the liquid to the dry ingredients by making a well in the center of the latter and pouring all the liquid into the well. The two parts are then stirred together vigorously until well mixed.

While the texture of a cake made by the muffin method is not so fine as can be obtained by other methods, a light cake of even grain and good volume can be made in a short time and with little work. Also, when soft fats and oils are used, the muffin method may give as desirable results as a more laborious and time-consuming one. A beginner can usually make about as good a cake with this method as an experienced cook.

Avoid having the melted fat extremely hot or almost cold. An extremely hot fat warms the mixture too much and one that is too cold does not mix well.

MUFFIN-MERINGUE METHOD. For extra lightness, or to cut down the amount of baking powder, the eggs may be separated and the stiffly beaten whites folded in last, as in a modified muffin method. This, of course, increases the time and work of mixing.

Experimental work shows better results when the whites are made into a meringue with a part of the sugar than when the stiffly beaten whites alone are put in last. The sugar increases the stability of the egg-white foam, resulting in better texture and volume. This muffin-meringue method gives very satisfactory results when oils and soft fats are used.

MODIFIED MUFFIN METHOD. Another variation of the muffin method, when a solid fat is used, consists of cutting or rubbing the fat into the dry ingredients, rather than melting it and adding to the liquid. This is another speed method which some cooks prefer to melting the fat. It gives satisfactory results for plain cakes.

The fat should be cut or rubbed so fine that the dry mixture resembles corn meal.

Conventional Method. In the opinions of many authorities in the field of food preparation and of many excellent cooks, the "good old-fashioned conventional method is still unequaled" for making cakes. This method, however, is laborious and time-consuming and at the same time requires a high degree of skill. It can be used to advantage with comparatively rich cakes of relatively low sugar content. Since one of the main points in this method is the creaming of the fat and sugar, a fat of high creaming quality is assumed.

The steps and the order of work for the conventional method of making a cake are as follows: (1) cream the fat until it is light and fluffy; (2) add the sugar gradually and continue creaming until the two are blended into a fluffy mass; (3) add the egg yolks and beat until they are well blended with the fat and sugar; (4) sift the dry ingredients—

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Conventional Method for Making Cakes · (*Upper left*) Gradually add the sugar into the well-creamed fat. Continue creaming until it is light and fluffy. (*Upper right*) Add beaten yolks to the creamed mixture of fat and sugar. (*Lower left*) Add sifted dry ingredients and milk alternately. (*Lower right*) Lastly fold in the well-beaten whites

flour, baking powder, and salt—together; (5) add the flour mixture alternately with the milk and flavoring, beginning and ending with the flour; and last (6) fold the stiffly beaten whites into the well-mixed batter.

When this method is used to its best advantage the result is an even, fine-grained cake of feathery lightness and "melt in your mouth" quality. Following carefully the order of work does not insure a cake as just described, even with the highest quality of ingredients and proper baking. Work, time, and skill play important roles in attaining the results desired. Thoroughness in combining the ingredients is of major importance. When this is skimped the results show in the finished cake. For example, creaming the fat and sugar should be continued to just the right point; the two should be blended into a smooth fluffy mass resembling whipped cream. This well-creamed foundation is essential to a fine-grained feathery cake.

It is difficult to state the amount of time needed for mixing a cake by this method, since an experienced cook works more rapidly than a beginner. When mixing by hand, few experienced persons will complete it in less than 15 minutes of working time, taking time out for resting.

There are a number of variations of the conventional or standard method. Some of these follow.

Conventional-Meringue Method. Just as with the modified muffin method, the separated egg whites may be made into a meringue with a part of the sugar. This meringue is folded into the batter last. Excellent cakes of feathery texture have been made from lard by this method.

Whole-Egg Method. Instead of separating the eggs and adding the yolks to the creamed fat and sugar, the whole eggs may be added at this stage. When the whites are not beaten separately and added last, more baking powder is needed. The whole eggs may be well beaten before adding to the creamed fat and sugar, which makes them combine more easily and adds some extra air to the mixture.

As a shortcut in this method, the eggs may be added unbeaten, one at a time, to the creamed fat and sugar. This method, however, requires vigorous beating and unless an electric mixer is used, it is easier to beat the eggs before adding them.

New Speed Method. For many years there has been little change in cakemaking. Most cakes of the group containing added fat have been made by the standard or conventional method. There have been quickly made "dump cakes" made in electric mixers and cakes made by the muffin method; but, in the main, these quickly made cakes were usually plain economy cakes, made to be eaten at once or served with a hot sauce.

Not everyone wants always to serve these plain cakes, nor does everyone have the time, patience, and skill required for the conventional method of making a cake. To solve this problem, a new speedy method of making cakes has been developed. This method is an adaptation of one long used by professional bakers, and for this reason has been called, by some authorities, the "modified bakers' method." By others, it has been named the "one-bowl method," since one bowl is all that is needed to complete the process of mixing the cake. Essentially the same method also is known as "quick-mix," "easy-mix," "mix-easy," etc.

There is no doubt that cakes made by this method are an accepted product and that those who use the method are enthusiastic about it. The advantages are that, first, it saves time, and, second, the beginner can use it with almost the same degree of success as the experienced cook. There is no creaming of the fat and sugar and no separate beating of the yolks and whites. The mixing time is less than that required in the conventional method, and there are fewer utensils to wash afterwards.

For success, however, this method calls for more sugar than other methods; therefore, the cakes made by it are sweeter and are spoken of as "high sugar ratio" cakes. Furthermore, not all fats can be used with equal success. The ones most often recommended are the hydrogenated vegetable shortenings containing a small amount of an emulsifying agent. High-grade lards also have been used successfully.

Usually there are four main steps in the speed method. These are: (1) sift the dry ingredients—flour, sugar, leavening, and salt—together into the mixing bowl; (2) add the fat, milk, and flavoring; (3) beat vigorously for two minutes by hand (150 strokes per minute) or two minutes in the electric mixer; and (4) add the unbeaten eggs and beat for another two minutes.

Variations in Speed Method. A number of slight variations in these four steps have been developed in different laboratories, but essentially the method is the same. One variation from the above order of work set forth is used by some bakers. After the dry ingredients and the fat are in the mixing bowl, the unbeaten eggs and half the milk are added before the first two minutes of beating. Lastly, the remainder of the milk and the flavoring are added and the batter is given the final two minutes of beating.

With some lards, the best texture has resulted from creaming the lard with an equal measure of the flour before adding the remaining dry ingredients and the liquid. Also, better results have been obtained with lard when the milk is added in two installments, and the eggs one at a time. The total mixing time, however, is approximately the same as that stated above.

This speed method is extremely easy to use with an electric mixer; but the beginner may find it necessary to take time out frequently for resting when beating by hand. The four minutes of beating mean actual beating time.

The texture of cakes made by the speed method is very fine and even, and quite different from that resulting from the conventional method. The grain is finer and it might well be described as "velvety," in contrast to the "feathery" texture which is the aim of the conventional method.

Each of these three basic methods of making cake gives a different finished product. The cakemaker will have to choose according to the type of cake she prefers and the amount of time she can devote to the job.

Batter into Pans. In pouring the batter into the pans, which should be prepared before the cake is mixed (see page 299), divide equally among the muffin cups or layer pans. (A three-cups-flour recipe will make three eight-inch or three thin nine-inch layers, or about 24 medium-sized cup cakes.) Pour some batter into each pan or cup; then even up the amount of batter in each. If necessary, level off the batter with a spatula or rubber bowl-scraper. The cake should be baked at once, or covered and placed in the refrigerator until time to bake.

BAKING THE CAKE

For a successful cake, there must be proper baking. The objectives of the baking are these: (1) to permit the cake almost to double its original height; (2) to cook the starch and coagulate the protein of the flour and egg so that the cake will remain light; and (3) to brown the cake.

Baking Temperature. The temperature which will best accomplish these results depends upon several factors, including the kind of leavening, the sugar content, and the thickness of the cake.

Leavening Agent. When air alone is used for leavening, as in most pound cakes, the baking temperature should be the same as for sponge cake—approximately 325° F.

When a chemical leavening agent is used, the temperature must be higher, in some cases as high as 375° F. In general, cakes leavened with both air and chemical agents should be baked at temperatures between these two extremes.

The kind of baking powder also plays some part in the baking temperature. A slightly lower temperature gives better results with slow-acting powders than is best with fast-acting powders. Some authorities recommend two temperatures for baking cakes: a low temperature to allow the cake to rise to its full height and a higher temperature to complete the baking. The first of these two temperatures may be varied according to the kind of baking powder—300° F. for 10 to 20 minutes for the slow-acting powders and 350° F. for the fast-acting ones. In each case, the final temperature is 375° F. Experience has shown, however, that satisfactory results can be obtained with constant baking temperatures for cakes—approximately 375° F. for cakes made with fast-acting powders and slightly lower than that for those made with slow-acting powders. The improvement in results accomplished by the use of two baking temperatures usually does not justify the extra trouble of regulating for two temperatures.

Sugar Content. Since sugar increases browning, the amount and kind of sugar used are factors affecting the baking temperature of cakes. This, in part, explains the use of lower oven temperatures for cakes as compared with muffins. Most sirups, especially molasses and honey, brown at lower temperatures than granulated sugar. For example, gingerbread made with molasses, and honey cakes, are baked at lower temperatures than other cakes.

Size of Cake. The size or thickness of the cake should be considered in deciding the temperature to use for baking it. In general, large cakes, such as loaf cakes, require lower temperatures than small cakes, such as cup cakes, or cakes baked in layers or in a thin sheet.

Arrangement in Oven. In placing pans in the oven, arrange the oven rack and the cake pans so that the top of the cake is as near the center of the oven as possible. When baking two layers, place the pans in opposite corners, with at least two inches between the sides and back of the oven and the pans. When the cake is baked in three layers, place the third pan on another rack, two inches above or below the one with two pans. Avoid placing one pan directly above another.

An oven thermometer is the best measure of the oven temperature. It may be used for checking the oven regulator; or, if there is no regulator, the gas may be adjusted by hand with the help of an oven thermometer.

Baking Time. If the oven is perfectly regulated and the baking temperature has been tested for the particular cake being made, it is best not to open the oven door for testing until the minimum baking time is almost up. Then make the test as quickly as possible.

The following baking times are only approximate, since they apply to one particular cake recipe; but they will serve as a guide and in that way will help in working out baking times and oven temperatures for other cake recipes:

Cup cakes	375° F. for 20 minutes
Layer cake . . .	375° F. for 25 minutes
Sheet cake	375° F. for 30 minutes
Loaf cake	325° F. for 45 to 55 minutes (size of loaf pan: 5 × 9 inches)

A slightly lower temperature, with a consequent increase in time, is best for most chocolate cakes.

Test for doneness by touching the top of the cake, in the center, lightly with a finger. If the slight indentation springs back, the cake is done; if the impression of the finger remains, the cake is not done and the door should be closed quickly.

As a double check, and perhaps a better test for beginners, use a wooden pick for testing. Insert it into the center of the cake. If it comes out clean, the cake is thoroughly baked.

As soon as the cake is done it should be removed from the oven to prevent drying out. Let it stand in the pan for five or seven minutes or until the cake shrinks from the sides of the pan as it begins to cool. Then it may be loosened with a spatula, permitting air to get in around the side of the cake, and turned onto a wire cooling rack. If the pan was lined with waxed paper, the paper should be peeled off at once.

BAKING AT HIGH ALTITUDES

Atmospheric pressure is very important in the baking of flour mixtures. The ingredients most directly affected are those which furnish the leavening, when the leavening is steam or carbon-dioxide gas. The volume of gas obtained from steam, baking powder, or soda varies with the atmospheric pressure. Equal amounts of baking powder or soda added to mixtures at sea level and at high altitude produce a greater volume of gas at the high altitude. The same is true of steam; therefore baking powder, soda, and liquids which form steam should be decreased in batter and dough mixtures as the elevation becomes higher and the atmospheric pressure is less. Table LXIII shows the adjustments which have worked successfully in baking powder and soda for two-cups-of-flour cakes and gingerbread.[1]

TABLE LXIII · *Changes in Leavening When No Other Corrections Are Used*
(For cakes and gingerbread using 2 cups flour)

ALTITUDE	BAKING POWDER ALONE (Cakes)	SODA ALONE (Gingerbread)	BOTH BAKING POWDER AND SODA (Devil's-Food Cake)		OVEN TEMPERATURE[3]
			Baking Powder	Soda[2]	
Feet	*Teaspoons*	*Teaspoons*	*Teaspoons*	*Teaspoons*	°*F.*
Sea level	2	$\frac{3}{4}$	$\frac{3}{8}$	1	350
2,500 to 3,000 .	$1\frac{1}{4}$	$\frac{3}{4}$	$\frac{3}{8}$	1	350
5,000 .	1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{2}{3}$	350
7,500 .	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	350
10,000 .	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	360[3]

Since at 10,000 feet the internal temperature attained within cakes during baking is lower than at sea level, because of the lowered boiling point of water, the strength or rigidity of the cakes derived from the flour and eggs is less; therefore, those ingredients which make cakes tender, fat and sugar, and those which give added strength, eggs, are indirectly affected by high altitude. Both fat and sugar should be decreased at 5,000 feet and above: approximately 10 per cent at 5,000 feet, 15 per cent at 7,500 feet, and 30 per cent at 10,000 feet. Eggs should be increased by the time 10,000 feet is reached, approximately one extra egg to a two-cups-of flour cake.

Cakes containing large amounts of sugar, fat, and eggs show the most pronounced effects of high altitude.

ICING THE CAKE

Icing a cake serves two purposes. First, by covering the outside it prevents drying out and keeps the cake moist. Second, the icing increases the attractiveness and palatability of the cake.

All icings are candy mixtures and the principles used in candymaking should be applied in their preparation. They are simply cooked to a lower concentration. Cake icings or frostings may be classified as follows:

Uncooked Icings. Confectioner's sugar or powdered sugar is added to a liquid or to a suitable fat, until the consistency is right to spread. Frequently both fat and liquid are used. These icings are seldom as smooth as properly prepared cooked icings, but are quickly made and there is little chance for a failure. Butter icings (same as hard sauce) are especially easy to handle when used in a pastry tube to decorate a cake.

Boiled Icings. This group includes the fondant, fudge, caramel, and divinity icings. These should be cooked in the same way as the corresponding cream candies (except a few degrees less hard), cooled, and creamed. The icing may be spread on the cake before it begins to harden in creaming, or it may be resoftened in order to be spread on the cake; it may also be used with a pastry tube for decorating the cake. Small cakes are frequently dipped in icing just as large candies are dipped in melted fondant.

Some of the most desirable icings are those given a special texture by the addition of egg white to the sirup. The texture which re-

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[1] *Cakes and Cookies.* Bulletin No. 489, Colorado Experiment Station, pp. 18, 20, and 33.

[2] This depends upon how the soda is used and the type of chocolate or cocoa.

[3] At 10,000 feet the internal temperature attained within the baking cake has been found to be at least 18° F. lower than at sea level, because of the lowered boiling point of water. Hence the oven temperature must be increased.

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Making Double-Boiler Icing · (*Left*) Place ingredients in top of double boiler over boiling water and beat until peaks hold from the beater. (*Right*) Remove from the hot water, add flavoring, and continue to beat until it is thick enough to spread

sults depends upon the number of egg whites to each cup of sugar used in the preparation of the sirup. The sirup is cooked, as in the case of divinity, to a somewhat higher temperature than would be used for a fondant or fudge type of icing (not over 238° F.), if only one egg white is used to each cup of sugar. If more egg whites are used, the temperature should be increased. A small amount of cream of tartar may be used, just as in fondant, to invert a portion of the sugar. This sirup should cream in the egg white, causing it to harden to the right consistency. If too much of the sugar is inverted, the icing becomes sticky and does not harden properly.

From 1 to 4 egg whites to 1 cup sugar can be used. The icing made with 1 egg white to each cup of sugar hardens quickly and must be handled with care to prevent its hardening before it is spread evenly over the cake. Where the proportion of egg is larger, it may be necessary to put the mixture in a double boiler and cook it over hot water to thicken. These icings should harden over the outside, but remain soft underneath. Small amounts of glycerin, 1 teaspoon to each egg white, sometimes are added to help keep the mixture soft.

The icings with a large proportion of egg are used for the decoration of cakes. These icings are cooked over hot water until a spoonful dropped on a smooth surface will hold its shape. The mixture then is forced through pastry tubes onto the cake, which already has been covered with a thick layer of icing of the same sort. Pastry bags of plastic, oiled silk, or close canvas with metal tubes, or cornucopias of glazed paper with appropriately cut ends, may be used.

Gum arabic and gelatins may be used in connection with sirups to give special texture to icings, just as to candies. These alone are usually too rubbery to be desirable, but are used most frequently in connection with egg white and sirup. Marshmallows cut into the hot icing serve the same purpose.

Double-Boiler Icing. A satisfactory icing can be prepared quickly and easily in a double boiler, by using 1 cup sugar and $\frac{1}{4}$ cup water to each egg white. This mixture is placed over boiling water and beaten constantly with a rotary beater until it thickens and tends to hold its shape, which usually takes about seven minutes. It is then flavored and quickly spread on the cake.

Cake Filling. A filling is a sweet-flavored mixture to be spread between the layers of a cake to increase the food value and palatability. In some cases a filling is used over the top instead of an icing. A filling is most satisfactory on a cake that is not to stand very long before being eaten, as some fillings are sufficiently moist to soak into the cake and make it soggy. For cakes which are to be kept a longer time, an icing makes the most desirable filling.

The most common fillings are made on the basis of well-flavored, thick custards, and cream-pie fillings. (See page 322.) Whipped cream and whipped cream and egg white also are used. Dried fruits, dates, raisins, and figs cooked in a thick sirup make fillings that do not soak into the cake. They are used on cakes that are to be iced over the sides and top.

The cake should be iced as soon as it is thoroughly cool, since one of the purposes of the icing is to keep it in a fresh condition. In order to keep the crumbs from mixing with the icing and giving an untidy appearance to the outside of the cake, it should be crumbed or spread over with a thin layer of icing which is allowed to dry before the remainder is put on. This serves to hold the crumbs in place, and the remainder of the icing can be applied without danger of loosening crumbs.

If the icing is thick, it can be spread evenly by first dipping a spatula or knife into hot water. A more even sheen is obtained if the icing is poured on smoothly and allowed to dry on the outside without too much handling.

For layer cakes, place one layer, rounded side down, on the cake plate and spread with icing. Should the icing be too soft to stay in place, do not put on the next layer immediately. When icing has set enough, place second layer, flat side down, gently on top of it. The layers may be held in place with wooden picks.

When the layers are all in place, ice the sides of the cake, holding the spatula in a vertical position and pulling the icing up from the bottom toward the top of the cake.

Last, pile the remaining icing on top of the cake and spread it lightly, giving it an uneven appearance. A cake is more attractive if the icing is left somewhat rough, unless it is to be decorated by the use of a pastry tube.

CARE AND STORAGE

To keep a cake from drying out, it should be stored in tin, under glass, or in another airtight container. Cakes high in fat dry out less quickly than those low in fat.

Icing the Cake · (*Left*) Spread icing carefully on lower layer; fit the next layer. (*Right*) Ice the sides, holding the spatula in a vertical position and lifting the icing toward the top. Pile remaining icing on the top. Leave the surface uneven.

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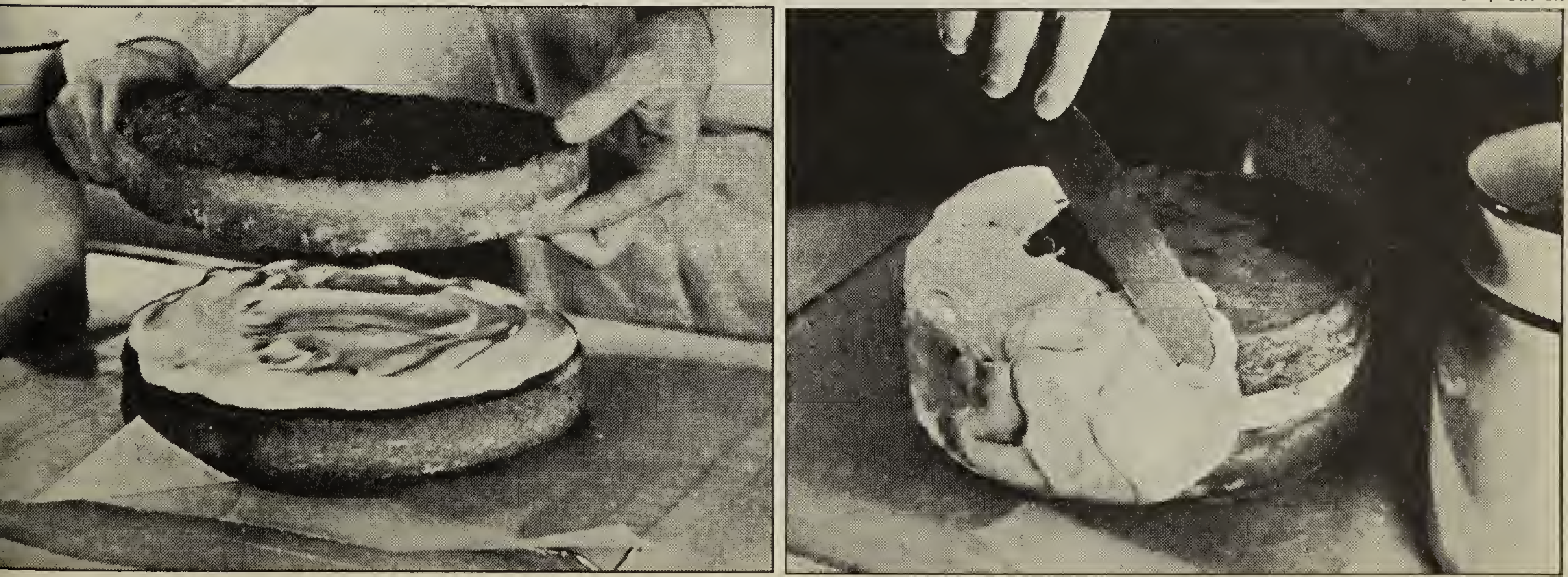

Cake Showing Good Texture and Attractive Icing and Showing Use of Filling

An excellent way to keep cakes is to wrap them in vapor-proof cellophane and freeze them at low temperature. After freezing they may be stored as near 0° F. as possible. In this way they will retain their original freshness for many weeks.

COOKIES—VARIATION OF CAKE

A cookie might be called a tiny cake. Cookies of one group are meringues (see pages 331–333), dried crisp in a slow oven. Most cookies are modifications of cake, however. There are sponge-cake mixtures baked in forms and called "ladyfingers"; others made sufficiently stiff to retain designs pressed upon them, called "springerle"; and a large group of varied products made from a base of cake containing fat. Those in this group are made by decreasing the amount of liquid in cake to form sheet cookies, drop cookies, rolled and cut cookies, and molded and sliced cookies.

Sheet or Drop Cookies. From a cake batter which pours, the liquid is decreased to form a drop batter. For sheet cookies, the batter is spread out in a thin layer on a greased pan or sheet for baking and cut into cookies after baking. For drop cookies, the batter is dropped from a spoon onto a greased baking sheet. While in some cases the same batter may be used for either kind, sheet cookie batter may be too thin for good drop cookies. The latter must contain enough flour to liquid to prevent their spreading too much during baking. Either kind may contain various additions to the batter, such as cereals, dried fruits, nuts, spices, and chocolate.

Cut or Sliced Cookies. For these cookies, the liquid of the cake batter is decreased to form a very stiff dough, stiff enough to roll thin for cookies to be cut in various shapes with cookie cutters. The same stiff dough may be molded and chilled in the refrigerator and then sliced into thin cookies for baking, making the so-called refrigerator cookies. Refrigerator cookies may be richer, higher in fat, than those to be rolled. Cookies may be sliced more quickly than they can be rolled and cut, but the old-fashioned rolled ones, cut in designs to fit the occasion, will always be popular. Sheet cookies and drop cookies are quickly made.

Other Differences from Cake. Besides the reduction in liquid, or its omission, to form a stiffer batter or a dough, cookies, in general, have a different texture from cake. The smaller amounts of liquid and leavening give them a less light texture than cake.

Many cookies are crisp, the result of extra fat and egg added to the basic cake proportions. With high fat and egg, the liquid may be entirely omitted. This is the case with the well-known sheet cookies frequently called brownies and some drop cookies. Some cookies have a chewy consistency which is the result of using extra sugar. Cookies with a large proportion of sugar are hard at first, but soften on standing.

Baking and Icing. Since cookies are smaller than cake they may be baked at a slightly higher temperature than the cakes of this group (from 375° to 400° F.), depending

Chocolate Drop Cookies

½ cup fat
2 squares chocolate
1½ cups sifted flour
1 cup brown sugar
½ teaspoon salt
¼ teaspoon soda
1 teaspoon baking powder
1 cup nuts, chopped
1 egg, beaten
1 teaspoon vanilla
⅓ to ½ cup milk

1. **Melt fat and chocolate over hot water.**
2. **Sift flour, sugar, salt, and leavening together. Stir in nuts.**
3. **Add melted fat and chocolate, beaten egg, and vanilla to the dry ingredients with enough milk to make a stiff drop batter.**
4. **Drop with a teaspoon onto a greased cookie sheet.**
5. **Bake at 400° F. for 15 to 20 minutes or until done.**

upon their thickness. On the other hand cookies are frequently very high in sugar and some are leavened entirely by air. In these cases, a temperature of not above 350° F. is best.

Cookies may be iced, usually with a simple fondant or uncooked icing. Instead of icing, sugar may be sprinkled over them; colored sugars give them a festive air.

Cookies also may be filled. Two rolled and cut cookies may be put together with marmalade, dried fruits, or mincemeat and the edges sealed to hold in the filling.

Cookies, like candy and fruit cake, are associated with holiday time. Those kinds which keep well or improve on standing make the best Christmas cookies, since they can be made in advance.

The cookie recipe above will serve to illustrate the principles brought out above. It may be varied considerably to get different results. Any good cookbook will suggest many others.

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Halliday, Evelyn G., and Noble, Isabel T. *Hows and Whys of Cooking*, 3d ed., Chap. IV. University of Chicago Press, Chicago, 1946.

Lowe, Belle. *Experimental Cookery*, 3d ed., pp. 480–521. John Wiley & Sons, New York, 1943.

XXIII · Yeast-Leavened Breads

When the generic term "bread" is used without qualification it may refer either to a quick bread or to a yeast-leavened bread since the term includes both types. The quick breads were discussed in the chapter on "Batters and Doughs." This chapter deals with those flour mixtures made light by fermentation of the carbohydrates in the dough brought about by yeast and other microorganisms. In some sections of the country yeast-leavened bread is called "light bread."

Another bread leavened by fermentation is known as "salt-rising bread." The leavening in this case is accomplished by gas-forming bacteria. Salt-rising bread, however, is of far less importance than the large number of yeast-leavened breads, because of its limited use.

Formerly, the making of yeast-leavened breads was an important part of food preparation in every home. Now, in the main, it is confined to isolated farm homes, to the preparation of rolls of one kind or another or to those localities or families where the making of certain breads is a tradition. The commercial bakeries, which make more than 80 per cent of the bread used in this country, have practically removed from city and town homes, at least, the making of bread in quantities to supply the family needs.

There is, however, a fascination about breadmaking that has few equals in cookery. Knowing something about the ingredients which go into bread and understanding the principles of handling them make this time-honored job even more interesting, and much more certain in results.

YEAST-LEAVENED BREADS

The equipment necessary and the ingredients which go into yeast-leavened breads are little different from those required for quick breads. If enough bread is baked at one time to supply the family for several days, a much larger mixing bowl is needed than for making a quick bread for one meal, probably a six-quart bowl. Enough bread pans and baking sheets to accommodate a day's baking of bread and rolls also are needed. Loaf bread pans of good size measure eight and one-half by four and one-half by two and three-fourths inches. This size pan makes a one-pound loaf.

The essential ingredients for yeast breads are flour, liquid, and yeast. Added to these are salt for flavor; usually sugar for flavor, good browning, and for speeding up the activity of the yeast; and fat for richness and tenderness. Eggs may or may not be added. They give flavor, richness, and food value and are used in fancy breads. Fruits, spices, nuts, and other additions may go into these special breads.

Flour. The kind of flour is of great importance in breadmaking, since this is the chief ingredient in bread. Both hard-wheat and soft-wheat flours make good yeast breads when handled correctly, but hard-wheat flour has special breadmaking qualities. (See page 285.) The harder flours contain comparatively large amounts of firm, elastic gluten, which produces breads of larger volume and somewhat more open grain than those made from the softer flours. Flours which have good breadmaking quality are spoken of as "strong" flours, in contrast to "weak" flours, or those low in breadmaking qualities. There are a number of factors which determine the breadmaking quality of a flour. Not only must the flour have a high gluten content, but the mineral salts and acids in the flour play an important part, since they may change the character of the gluten present.

The flours most used for breadmaking in the home are the "all-purpose," "general-purpose," or "family" flours. These terms all mean that such flours are milled from wheats which yield flours that give good results in the various types of baking done in the home. There are, however, all-purpose flours milled from both hard wheat and soft wheat. Those from soft wheat require somewhat shorter fermentation periods than those from hard wheat, and produce loaves of somewhat smaller volume. Hard and soft flour may be recognized by the "feel." If a little is rubbed between the fingers, hard-wheat flour feels slightly granular, while soft-wheat flour has a smooth satiny feel. A handful of soft-wheat flour has a tendency to "cake" when the hand is closed tightly and released, while hard-wheat flour falls apart. Because of the difference in the quality and quantity of the gluten, hard-wheat flour requires more liquid than soft-wheat flour. Since early in 1941, all-purpose flours have been available in enriched form. (See page 284.) Enriched flour bakes in exactly the same way as any other white flour. In testing a flour in the home for its breadmaking qualities, it is well to follow the directions furnished with the flour.

Liquid. The liquids most used in the preparation of yeast bread are water and milk. In breads made with water the wheat flavor predominates. Many of the crusty varieties of bread and rolls, such as hard rolls and French and Vienna breads, are made with water. The crustiness is due mainly to the baking, however.

In some cases, the water in which potatoes have been boiled is used, since it promotes the growth of yeast. If some of the cooked potato is added, it contributes toward keeping the bread moist. The amount used must be small, since it dilutes the gluten content and interferes with the lightness of the bread.

Milk increases the food value of the bread. This is an especially desirable place to use skim milk or skim-milk powder. Fluid milk should be boiled to kill bacteria and stop the action of protein-splitting enzymes. Skim-milk powder can be used in amounts up to $\frac{1}{3}$ cup to a pound of flour. Diluted evaporated milk also may be used, but needs no scalding. For sweet breads, condensed milk sometimes is used.

Buttermilk may be used in yeast bread. It yields a bread with a fine, velvety, uniform texture, with an improved color and bloom of crust, and a distinctive flavor. While commercial lactic acid may be used with good

Loaves of Bread · They may come in different shapes and sizes, but all must conform to local laws as to weight

U.S.D.A.

results, that present in a good grade of buttermilk is equally satisfactory and might well be used more widely than it is. Whey, too, may be used with good results, since it is high in lactic acid and minerals.

Yeast. The use of yeast as a leavening agent is discussed in the chapter on "Leavening Agents." At present there are three forms of commercial yeast available to the homemaker: compressed, fast dry granular, and dried yeast cakes.

Compressed or moist yeast is active and begins developing as soon as food, moisture, and warmth are supplied. This yeast must be kept under refrigeration.

The new fast-rising granular yeast also is active and develops as soon as the proper conditions are provided. It can be used like compressed yeast, but in making bread with milk, it is best first to soften this yeast with a small quantity of lukewarm water. This yeast need not be refrigerated and keeps longer than compressed yeast.

The dry yeast cakes, consisting of inactive dried yeast cells mixed with corn meal, require a long fermentation period. This yeast, however, keeps longer than any other commercial form of yeast.

Because of the speed of fermentation, either compressed or fast granular yeast should be used with soft-wheat flour. Long fermentation weakens the tender type of gluten in soft-wheat flours.

If yeast is handled properly, it not only leavens bread but brings about a number of fermentative changes in the dough which help to give yeast bread its particular character and flavor.

Salt. Salt is added to bread for flavor, and it also helps to control fermentation. In too large a quantity, salt retards the action of the yeast. Some cooks use slightly more salt in summer than in winter, since warm weather tends to speed the fermentation too much. Salt also seems to have some effect on the gluten in the flour, helping it to stretch without breaking, as the gas from the yeast expands.

Sugar. Sugar is not essential to breadmaking, since enzymes present in the flour can ferment the starch in the flour to sugar. Sugar, however, is quick food for the yeast. From simple sugar the yeast forms carbon dioxide and alcohol. (See page 292.) Less time is required to ferment sucrose (cane sugar) to simple sugar than starch to simple sugar. Any fermentable sugar may be used. In general, the amount of sugar used is just enough to start the activity of the yeast and give a bloom to the crust, but not enough to give the bread or rolls a sweet taste. Too much sugar is objectionable because of its effect on the gluten. It has a marked solvent action on wet gluten and diminishes the water-absorbing power of the flour. In small quantities it is possible that this solvent action may effect sufficient softening to increase the gas-retaining power of the dough and thus indirectly the strength of the flour. Sweet breads have more sugar in the dough than plain breads, but some of their sweetness comes from icings and candied fruits.

Fat. As in quick breads, fat in yeast breads improves flavor, gives richness to the bread and makes it tender. It is thought, also, that fat helps to increase volume by making the gluten meshwork more tender, so that the gas can expand it more readily. Fat also helps to make a velvety soft crumb, and helps to prevent the bread from drying out. Any well-flavored or bland fat may be used, such as lard, hydrogenated fats, mild salad oils, margarines, and butter.

Egg. Another ingredient which is not essential in yeast bread is egg. Whole egg or egg yolk is used in most fancy breads and rolls. In a few types of crusty breads and rolls, egg white is used. This replaces a part of the liquid. Egg causes the cell structure of yeast bread to become more delicate than it is without egg. Also the crust is thinner and more crisp when egg is used. Whole egg or yolks give a rich flavor and a creamy color to the crumb. Egg white gives a silky sheen to both crust and crumb. Rolls and bread made with egg white and water are characterized by an open texture and a crisp crust. French-type bread and rolls show these characteristics.

Other Additions. Dried and candied fruits and many kinds of nuts and spices are used in fancy breads, such as dessert breads, coffee cakes, and various sweet rolls.

Proportions. The proportion of liquid to flour, or flour to liquid, cannot be stated definitely since this relationship varies with the kind of flour. Enough flour should be used to make a dough that can be handled easily without being sticky. Best results are obtained when the dough is comparatively soft with not too much flour. Basic proportions are 3 to 4 cups of flour to 1 of liquid.

The amount of yeast depends upon the kind of flour and the amount of time available to make the bread or rolls. An average amount of yeast is from 2 to 3 per cent yeast, by weight, based on the flour weight. These percentages are about ½ to 1 ounce, or 1 to 2 cakes compressed yeast (or its equivalent), for a pint of liquid or for 2 pounds of flour. If using soft-wheat flour, or for refrigerator doughs, sweet doughs, or bread or rolls to be made in the shortest possible time, double this amount of yeast. This means that for approximately 4 cups flour and 1 cup liquid, 2 cakes compressed or 2 packages fast granular yeast are the maximum.

The usual proportion of salt is from 1 to 1½ teaspoons per cup of liquid or pound of flour. In plain bread or rolls, 1 tablespoon sugar to each cup liquid or pound of flour is sufficient. Sweet doughs may have up to ½ cup sugar to these amounts of liquid and flour. From 1 teaspoon to 1 tablespoon of fat is used for a cup of liquid or pound of flour. When eggs are used, 1 whole egg, 2 yolks, or 2 whites are average amounts for each pound of flour. Sweet doughs may have double this amount.

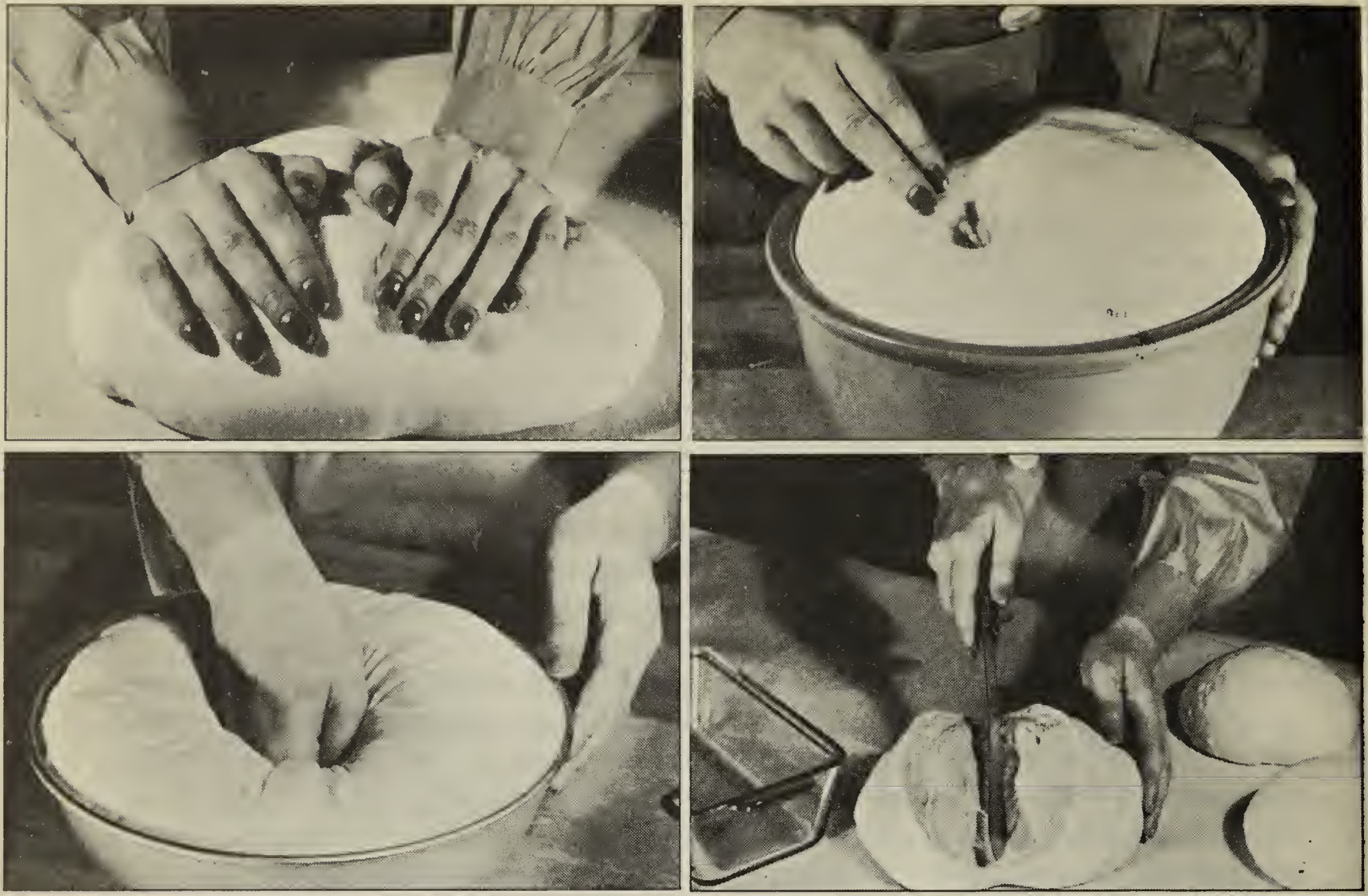
Methods. There are two basic methods of combining the ingredients for yeast breads: the straight dough method and the sponge method.

THE STRAIGHT DOUGH METHOD. In the straight dough method, all the ingredients are added at the first mixing. The completed dough is kneaded until satiny and then set in a warm place (80° to 85° F.) to rise. There are six well-defined steps in making bread by this method: (1) mixing the ingredients, (2) kneading the dough, (3) allowing the dough to ferment or rise (the baker calls it "proofing"), (4) shaping the loaves or rolls, (5) allowing the loaves or rolls to rise, and (6) baking.

These steps are given in detail in the chapter on "Batters and Doughs." (See pages 277 to 279.) Instructions on shaping or molding a loaf were not given previously, since it was suggested that the beginner make rolls before attempting a loaf.

When the dough has risen to double its bulk (a little less for soft-wheat flour) it is ready to be molded into loaves. (These steps are the same regardless of the method of mixing the dough.) The dough should be kneaded down and divided into as many portions as there are to be loaves. Each portion is made into a ball, covered to prevent drying and allowed to rest for at least 10 minutes. This step is not essential, yet it makes the dough more easily handled and improves the shape of loaves; so it is advised.

There are eight steps to good shaping of a loaf of bread, as follows: (1) flatten the ball of dough to about one inch thick and oblong in shape, pressing out the air; (2) fold lengthwise and flatten again; (3) stretch the dough until it is about three times the length of the loaf pan; (4) fold



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Basic Steps in Breadmaking · (*Upper left*) After adding the flour, knead the dough until it is satiny. (*Upper right*) Allow the dough to rise until it is soft to the touch. (*Lower left*) Punch down, to release excess gas. (*Lower right*) Divide into equal portions for loaves

the two ends to the center, overlapping and pressing together to seal; (5) fold the dough lengthwise and seal edges; (6) fold lengthwise again and seal edges; (7) roll dough to tighten the seam, and seal both ends; (8) place the roll of dough in a greased loaf pan, with the seam underneath. The molded loaf should come about halfway up the sides of the pan. After brushing the top with melted fat, set the loaf in a warm place (80° to 85° F.) to rise until it has doubled in bulk (a little less for soft-wheat flour). It is then ready to bake at 375° F.

Sponge Method. In the sponge method, there are two mixings. In the first, the liquid and yeast are combined and just enough flour is added to make a thick batter (usually about half the flour). This batter is set to rise in a warm place (75° to 79° F.) until it becomes light or is very bubbly. Then the sugar, salt, fat, and remaining flour are added to the light batter to make a dough that can be kneaded. From this point, the method is the same as the straight dough method, and the basic steps should be followed.

When the sponge method is used, the minimum amount of yeast is needed since the long method gives the yeast time to grow. The sponge is usually prepared at night and by morning it should be light. In cold weather, or when the yeast is not fresh, a little sugar (1 teaspoon) may be added to the sponge to provide quick food for the yeast. In warm weather, it may be necessary not only to omit the sugar but to add the salt to the sponge to retard fermentation slightly.

Because of the longer fermentation with the sponge method, the bread has a different flavor from that made by the straight-dough method. Some people prefer the flavor of bread made by the sponge method. Because the fermentation period is longer, the sponge method should be avoided when using soft-wheat flour.

New No-Knead Method. Breadmaking in the home, like cakemaking, has changed little through the years. A new "no-knead" method of making bread has been developed which is easy to use and saves some time. Also the beginner is able to use it with almost the same degree of success as the experienced home breadmaker. Kneading yeast breads by hand requires a certain technique and skill in determining when the dough has had sufficient kneading. This new method eliminates the step of kneading the dough. While many people prefer the type of bread made by the standard method, with its silken more delicate crumb, the "no-knead" method is presented here as a streamlined home procedure.

The proportions which have been recommended for one loaf of bread or 18 small rolls are these: approximately 3 cups hard-wheat flour to 1 cup liquid (half scalded milk and half water), 2⅔ tablespoons to ¼ cup fat, 1 to 1⅓ tablespoons sugar, 2 teaspoons salt, 1 to 2 cakes compressed or 1 to 2 packages fast granular yeast (mixed according to the directions on the package), and 1 egg.

Compared with basic proportions for yeast bread, it is seen that this dough is slightly softer (the flour is the minimum amount) and it is higher in fat than bread doughs intended to be kneaded.

The method of combining and mixing is as follows: (1) combine the scalded milk, fat, sugar, and salt; (2) cool to lukewarm by adding the cold water; (3) add the yeast and mix well; (4) blend in the egg; (5) add the flour and mix until the dough is well blended (the dough may be chilled in the refrigerator for two hours or more); (6) shape into loaf or rolls; (7) let rise in a warm place (80° to 85° F.) until double in bulk (about one hour for a loaf from unchilled dough or two hours for chilled dough); (8) bake loaf at 375° F. for one hour or rolls at 425° F. for 20 minutes.

As with any of the methods for making yeast bread, when the electric mixer is used, half the flour is added and the ingredients are mixed for about one minute at low speed. The rest of the mixing is done by hand.

Some women may find this "no-knead" dough a little stiff for stirring or beating easily, although it is too soft for kneading. For those who dislike the kneading step in the standard method of making yeast breads, another possibility is to decrease the flour still more to obtain a real batter which can be beaten easily. Yeast-raised muffins and cakes are made by this method.

Variations. Yeast breads may be varied by the kind of flour and the sweetness and richness of the dough. Also the same dough may be used to make loaves and a variety of styles of rolls.

Kind of Flour. Variation in plain breads and rolls may be obtained by using all or part whole-wheat or rye flour or part corn meal, bran, rolled oats, rice, or buckwheat. The volume and texture of these breads are not so good as in white bread because of the difference in the amount of the gluten. This

The Completed Loaf · Place formed loaf in pan, allow to rise until double in bulk, and bake at 375° F.

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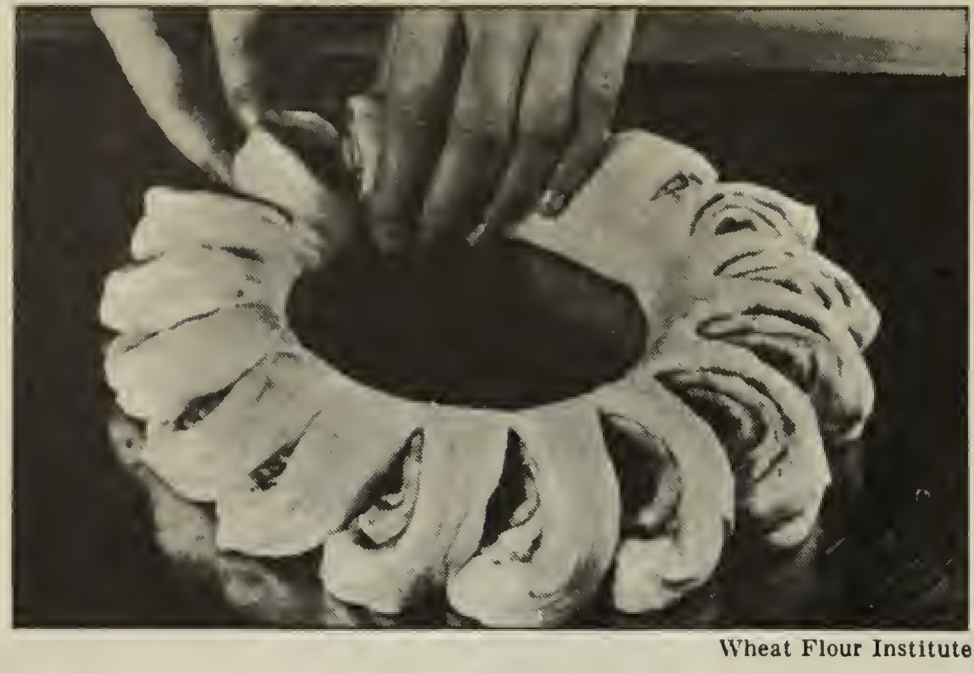

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Swedish Tea Ring

explains why most recipes for whole-wheat and rye breads or rolls call for approximately half the flour in the form of all-purpose flour. Some people, however, like the flavor and heaviness of these dark breads when made with all dark flour. Neither whole-wheat nor rye flour should be sifted before using.

Corn meal cannot be used by itself in the making of yeast bread, because it lacks gluten. The usual proportions are from ½ to 1 cup corn meal to 7 or 8 cups all-purpose flour. This kind of bread is better if the corn meal is first partly cooked in boiling water. (See page 288.)

Bran and the other cereals and flours mentioned may be used up to not over one-fourth of the total flour, by measure, keeping in mind that the volume and texture will not be so good as that made from white flour alone.

Sweet Doughs. The dessert breads, coffee cakes, and sweet rolls are made from a sweet, rich dough. Proportions for a foundation sweet dough are these: 2 cakes compressed yeast or 2 packages fast granular yeast, ¼ cup lukewarm water for the yeast, 1 cup scalded milk, ¼ cup fat, ½ cup sugar, 1 teaspoon salt, 2 beaten eggs, and about 5 cups sifted all-purpose flour. There are endless ways of using this sweet dough, including cinnamon rolls, caramel pecan rolls, braid coffee cakes, stollens, Swedish tea rings, and doughnuts.

Because of the high sugar content, breads and rolls made from sweet dough should be baked at 350° to 375° F. Doughnuts and their variations are fried.

Cinnamon Rolls. Roll sweet dough into a rectangle, one-fourth inch thick. Brush with melted fat and sprinkle with a mixture of sugar and cinnamon. Add raisins or currants, if desired. Roll like a jelly roll and seal the edge. Cut into one-inch pieces and place cut side down in greased muffin cups, a ring mold, or a deep pan. Brush tops with fat, milk, or cream, and sprinkle with the sugar-cinnamon mixture.

Caramel Pecan Rolls. Make a brown-sugar sirup. Place about ½ teaspoon margarine or butter in each muffin cup with a tablespoon sirup and 3 to 4 pecan halves on top. Roll sweet dough one-half inch thick and eight or nine inches wide. Brush with melted margarine or butter and brown sugar. Roll like a jelly roll and seal the edges. Cut into one-inch pieces. Place each, cut side down, in a muffin cup.

Stollen. Use half the foundation sweet dough for each stollen. When it is light add ¼ cup raisins and knead them into it. Cover for 10 minutes. Flatten the ball of dough into an oval sheet. Brush one half of the sheet with melted margarine or butter. Fold unbuttered half over buttered half. Place on greased baking sheet. When baked, brush with confectioner's icing and sprinkle with chopped nuts.

Swedish Tea Ring. Roll sweet dough into a rectangle about one-half inch thick and three times as long as wide. Brush with melted margarine or butter and sprinkle with brown sugar and cinnamon. Roll like a jelly roll and seal the edge. Shape into a ring on a greased baking sheet, sealing the ends together. With scissors, cut the ring, almost to the center, in slices about one inch thick. Turn each slice half on its side. Brush with milk or cream. After baking, cool and ice with confectioner's icing and sprinkle with chopped nuts or candied fruits or both.

Confectioner's Icing

¾ cup XXXXXX sugar
2 tablespoons milk
¼ teaspoon vanilla

Blend the milk with the sugar until of spreading consistency.

RAISED DOUGHNUTS. When making sweet dough add cinnamon, nutmeg, and mace, if desired. Roll dough one-half inch thick and cut with doughnut cutter. When light, fry on each side at 370° F. three minutes. When cool, roll in sugar.

Bismarcks, "long John's," and "twisters" are made and fried in the same way as doughnuts, only their shapes are different. Consult a cookbook for these variations of doughnuts.

Styles of Rolls. For the person who likes to serve homemade hot rolls, there is an endless number of forms which are easy to make. These rolls may be made from plain bread dough, although some of them may be made from the foundation sweet dough or from a dough halfway between the two extremes. Directions for making Parker House rolls and cloverleaf rolls are given in the chapter on "Batters and Doughs." (See page 278.)

QUICK PAN ROLLS. Roll plain dough to one-inch thickness or less and fit it into a greased 12 × 8 inch pan. With a sharp knife cut into 12 strips across the pan and then lengthwise down the center, making 24 rolls, one by four inches each. Brush top and cut sides with melted fat.

PENNY PUFFS. Pinch off small portions of plain dough, roll into balls, and place one ball in each greased muffin cup. Brush tops with melted fat.

CRESCENTS. Roll plain or sweet dough into circular shape, one-fourth inch thick. Cut into pie-shaped pieces. Brush with melted fat. Beginning at the outside edge, roll to the point and pinch together. Curve into crescents on greased baking sheet. When made from sweet dough, crescents may be iced after baking.

FAN TANS. Roll plain or rich (not sweet) dough into a rectangular sheet, one-eighth to one-fourth inch thick. Brush with melted fat. Cut into strips one inch wide. Pile six to eight strips one on top of another. Cut

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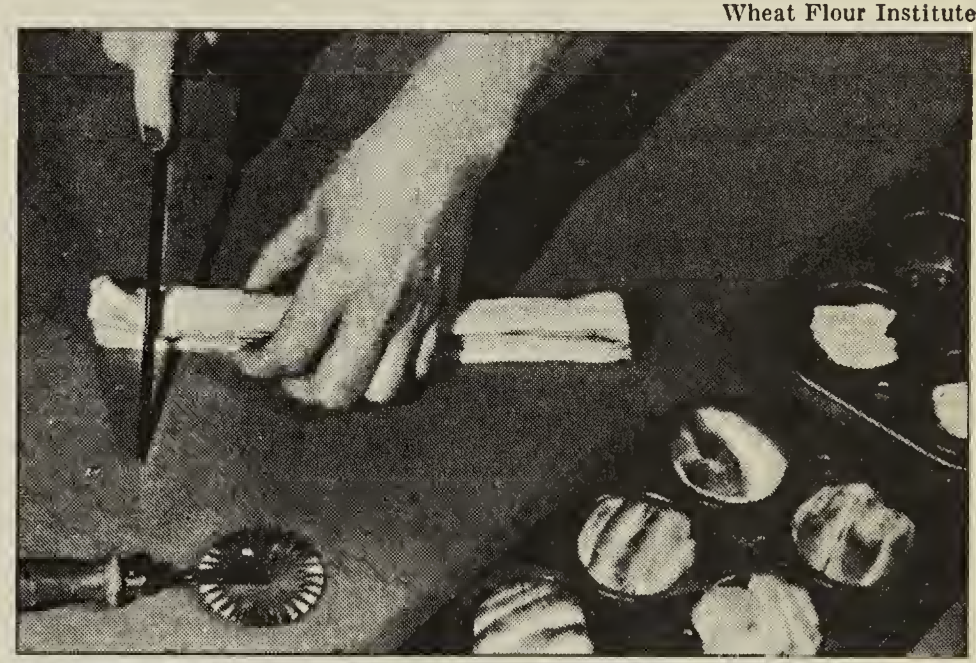

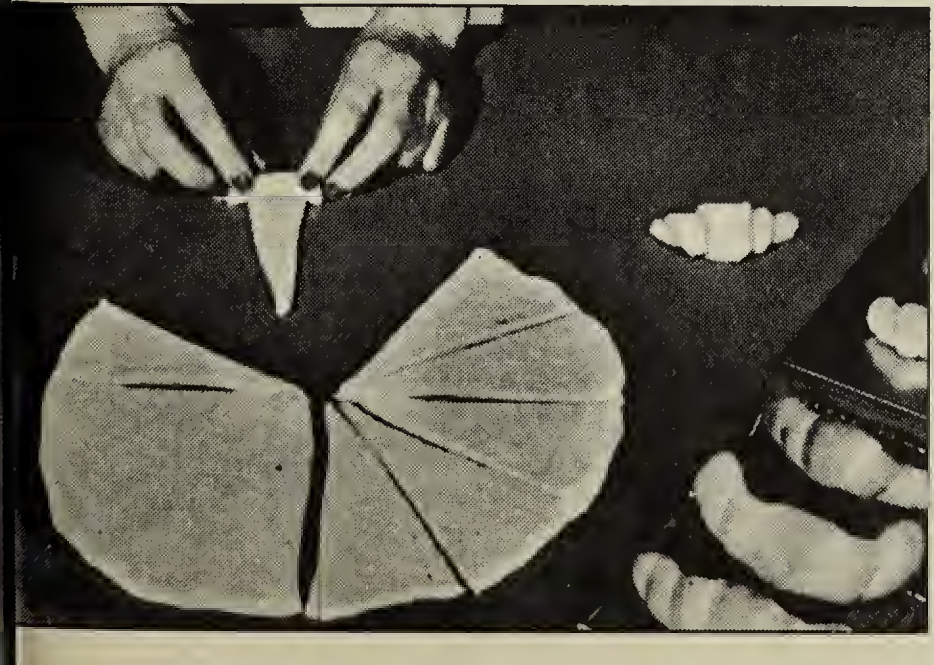

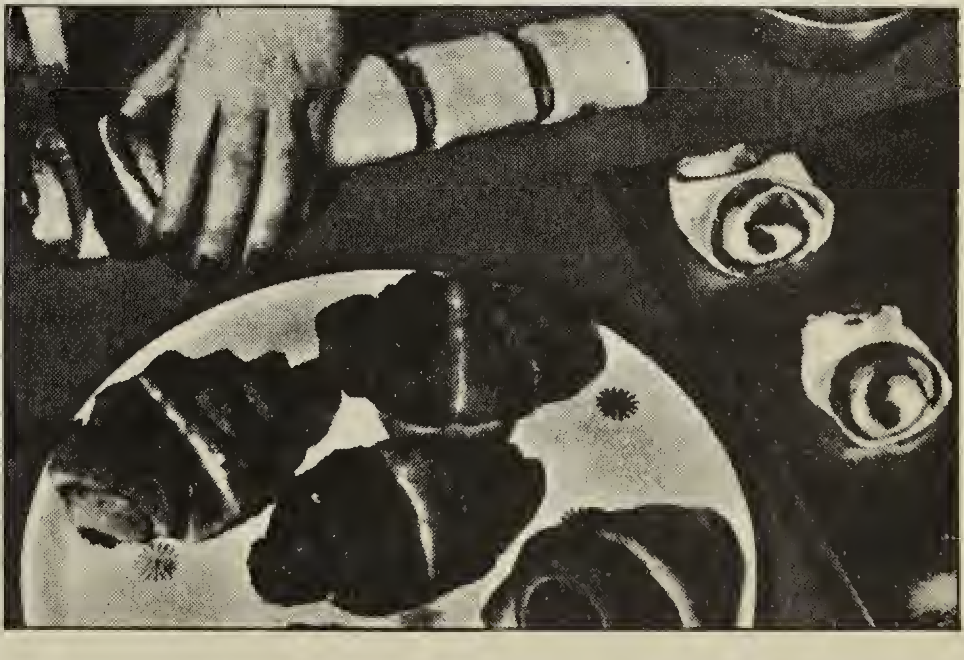

Crescents (*Lower left*); **Fan Tans** (*Upper right*); **Butterfly Rolls** (*Lower right*) pieces one and one-half inches long through the pile. Place each short pile on end in a greased muffin cup.

Bowknots. Roll dough under the hands into tiny rolls one-half inch thick. Cut in six-inch pieces. Tie each piece into a knot. Brush with melted fat and place on greased baking sheets.

Butterflies. Roll plain or sweet dough into a rectangle one-fourth inch thick and six inches wide. Brush with melted fat. Roll like a jelly roll and cut in pieces, two inches long. Press across the center of each piece with a knife handle. Bake on greased baking sheet.

When made from sweet dough, cinnamon may be added to the dough. Rolls may be iced, if desired.

SALT-RISING BREAD

As explained in the chapter on leavening agents, salt-rising bread is made light by gases that are liberated by the action of certain bacteria. As this bread is usually made in the home, these bacteria are obtained from corn meal. Salt-rising bread is made in the bakery from a ferment of the necessary bacteria, although the commercial culture used is usually called "salt-rising yeast." These bacteria are very resistant since they are in the spore state. Salt-rising bread is somewhat less light than that made from yeast, is more velvety in texture, and has a pronounced flavor and aroma. This flavor can be controlled by the use of scalded milk in the preparation of the bread and a pure culture of the bacteria responsible for the gas formation.

Preparation of Leaven. The ordinary household procedure for the preparation of the leaven is to use about 4 tablespoons corn meal, 1 teaspoon salt, and 2 teaspoons sugar. To these add 1 cup milk, heated to just below the boiling point. The mixture should have a temperature of about 167° F. This kills the microorganisms present except the certain spore-bearing bacteria which are the active agents in leavening the bread. This mixture is allowed to stand overnight at a temperature slightly higher than that of the body, and in the morning it should look light and puffy. It is then ready to use in making the bread.

The preparation of the leaven is the most difficult step in making the bread. The bacteria may be absent from the corn meal, the temperature of the mixture may be too high and kill the spores, or not high enough and allow the development of other forms that may be harmful. But what is more likely is that the sponge may not have been kept at the optimum temperature during the night. These different points can be controlled only through scientific methods and the best way to be sure of satisfactory results is to use dried cultures of the bacteria.

Nearly all the old recipes for the preparation of salt-rising bread called for the use of soda. This led to the assumption on the part of some authorities that the leavening effect was due to the liberation of carbon dioxide from the soda by the action of acids formed from the constituents of the bread by the bacteria. Many recipes which give excellent results do not call for soda; so it is not considered an important factor in leavening. The bacteria leaven the bread by breaking down certain of its constituents, principally the sugars, forming carbon dioxide and hydrogen. This leaven cannot be kept in a moist condition, for then the bacteria rapidly lose their gas-producing power. It can be kept without difficulty if dried.

Making the Bread. In the morning, if the mixture is fluffy, indicating that the organisms have developed properly, it is added to a sponge prepared as for yeast breads. This is allowed to rise until it is light to the touch and then flour is added to make a dough. The dough is formed immediately into loaves and placed in the pans. During rising, this bread should be kept at a temperature higher than that for yeast bread, about 100° F. It does not need to rise as long after the addition of the flour as in yeast bread, because the bacteria seem to have some specific influence on the gluten and their time of action may be limited to that which is necessary for the formation of the gas needed for leavening. Salt-rising bread is baked in the same way as yeast breads.

BAKERY BREADS

Breads, other than quick breads, are made only occasionally in most homes today. Yeast breads and rolls and also salt-rising bread are made by commercial bakeries and distributed through the retail trade. Most states and many cities have regulations regarding the weight of loaves of bread. Bread and rolls, "half baked," are now available on the market. Finished in the oven at home, these products have the aroma and texture of fresh-baked bread.

Wrapped Bread. Public sentiment and, in some places, health regulations demand that much of the bread sold to the consuming public be wrapped. The wrapping keeps the bread clean and helps to prevent its drying out. The package label tells the kind of bread, its weight, by whom made, and in somes cases the date of baking. If it is labeled "enriched" it must meet the minimum Federal standards for enrichment.

Sliced Bread. Most wrapped bread is sliced also at the bakery to save time at home. Bakeries do the slicing by machinery, so that the slices are uniform. The thickness does not fit all needs, however, but there are sliced breads of different thicknesses.

Care and Storage. Wrapped bread should be stored in the original wrapper in a cool place. Unwrapped bread should be wrapped in waxed paper or stored in a closed container. When necessary to hold bread several days or a week it should be wrapped in waxed paper or its own wrappings and stored in the refrigerator.

NUTRITIVE VALUE OF BREAD

A high proportion of the cereals produced in the United States is consumed in the form of bread. Bread is chiefly an energy food; yet there are valuable nutrients present which furnish essentials other than calories.

One ounce of white bread (one-half-inch slice) yields about 65 calories. Bread is often blamed for persons' being overweight when the real cause may be high-caloried spreads which the breads carry.

Because of the large amounts consumed, bread is a fair source of protein. An ounce slice furnishes approximately three grams of protein.

Bread may be a source of calcium when made with milk or dry-milk powder. Also, some enriched breads have calcium added, although this is optional.

Whole-wheat breads and enriched breads are good sources of iron, thiamine, riboflavin, and niacin. Enrichment was begun in February, 1941. As a war measure, in January, 1943, it was made mandatory that all white bread sold to consumers be enriched, through the use of enriched flour or by the addition of appropriate amounts of enrichment ingredients to the dough. In October of the same year the enrichment levels were raised; and

TABLE LXIV · *Federal Standards for Enrichment of Bread and Rolls*

Ingredients	Per Pound	
Required	*Minimum*	*Maximum*
Thiamine . .	1.1 mg.	1.8 mg.
Riboflavin . .	0.7 mg.	1.6 mg.
Niacin . . .	10.0 mg.	15.0 mg.
Iron	8.0 mg.	12.5 mg.
Optional		
Calcium . . .	300 mg.	800 mg.
Vitamin D . .	150 U.S.P. units	750 U.S.P. units

in May, 1944, the enrichment program was extended to include all white rolls and buns.

In October, 1946, War Food Order No. 1 requiring enrichment of all white bread was rescinded and the Federal regulations were made optional. A number of states and several territories, however, require that all white flour and white bread must be enriched. When breads are labeled "enriched," it means they are white bread which, in addition to the nutrients present in ordinary bread, has definite amounts of iron, thiamine, riboflavin, and niacin added. Calcium and vitamin D may be added. The Federal standards for vitamin and mineral enrichment of bread and rolls are given in Table LXIV.

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XXIV · Pies and Other Pastries

Pie is one of the most typical and best-liked of all American desserts. A good pie is dependent, first of all, upon the quality of its crust or the pastry from which it is made. Pastry may be used for other dishes than pies, and a few pies are made from a rich biscuit dough instead of pastry. The various kinds of pies and some other pastries are discussed in this chapter.

PIES AND VARIATIONS

A typical pie consists of one or two pie crusts with a filling. In a two-crust pie, the filling, usually fruit in a dessert pie, is placed between the crusts, and is baked.

In a one-crust pie, the crust may be either on top or underneath the filling, and crust and filling may be baked together. One kind of one-crust pie is the custard-type, which has a plain custard or a variation of a custard, such as pumpkin, baked in a crust. Another kind of one-crust pie consists of a baked pie shell filled with a cooked cream or other filling, such as chocolate, butterscotch, and chiffon. Such pies are called "soft pies."

The classification below shows the different kinds of pies.

Classification of Pies

I. *One-Crust Pies*
  1. Cream pies (in baked shells)
  2. Custard pies (baked in crust)
  3. Chiffon pies (in baked shells)
    a. Soufflé type (baked)
    b. Gelatin type (chilled in refrigerator)
  4. "Dutch" fruit pies (baked in bottom crust)

II. *Two-Crust Pies*
  1. Fruit pies
    a. Solid top
    b. Lattice top
    c. Turnovers
  2. Mince pies
    (Same variations in top as fruit pies)

III. *Either One-Crust or Two-Crust Pies*
  1. Cobblers (usually two-crust, but may be one-crust, either top or bottom)
    Large, shallow, any shape
  2. Deep-dish fruit pies (usually top crust only but may be two-crust)
    Deep, any size, any shape
  3. Meat pies (usually top crust only)
  4. Tarts (individual or very small pies of any kind)

Pie crust or the pastry used for making most pies is known as plain pastry in contrast to rich pastry or puff pastry. Rich pastry is never used for pie crust, at least not for the bottom crust, since it is too tender to hold the weight of most pie fillings. The proportions and method of making pie crust or plain pastry are given on pages 275 to 276.

PASTRY INGREDIENTS AND METHODS

Either pastry flour (soft-wheat) or bread flour (hard-wheat) may be used for either kind of pastry. Somewhat less fat (shortening) may be used with pastry flour, since a soft-wheat flour makes a more tender mixture than a hard-wheat flour.

Any of the cooking fats can be used in making pastry. Oils do not give a flaky pastry. Solid (plastic) fats are especially desirable for the richer pastries, since they do not combine with the flour and decrease the amount of water that can be added. Butter and margarines give good flavor to pastry and are often used in puff paste, where the proportion of fat is very high. For other pastries, shortness is the characteristic most desired, and lard, compounds (see page 147), or any of the hydrogenated fats may be used.

Experiment shows that lard has greater shortening power than the other fats. It is more pliable and workable over a wider range of temperatures than other fats, and does not show the brittleness that butter, many margarines, and hydrogenated fats show when used immediately upon removal from the refrigerator. This brittleness makes blending with the flour difficult.

The oils are difficult to use in pastries. They soak up the flour and make it impossible to add enough water to hydrolize the starch and leaven the pastry while making a dough that can be handled and rolled thin.

In using the various fats, one must work out substitutions on the basis of fat content. The shortening value also should be considered. Both the composition of the various fats used for shortening and their comparative shortening value are given in the chapter on "Fats and Their Uses in Cookery." The amount of water in table fats increases by just so much the total amount of water in the pastry if it is properly combined. This is one reason why butter and margarine make desirable puff paste.

When an unsalted fat is used in pastry, salt should be added in the proportion of approximately one teaspoon to a quart or pound of flour. When large amounts of salted fat are used it may be necessary to wash out some of the salt. This washing may improve the consistency of the fat, making it more pliable. Since it is desirable to keep the fat as hard as possible, it is well to keep it cold and to use cold water in mixing.

Basic proportions for plain pastry or pie crust are given on page 275 and in the table on page 279. The method for making a flaky pie crust is given in the same chapter. There is another method of combining the ingredients for pastry, but the result is a mealy pie crust rather than a flaky one. It is known as the hot-water method. Boiling water is poured over the fat and the two are beaten together until creamy. This fat and water mixture is then stirred into the sifted flour and salt and the whole tossed together with as little working as possible. Overmixing should be avoided in this method as in the standard method. The dough should be chilled in the refrigerator for several hours before rolling. A light, tender, though not flaky, crust can be made by this method even by beginners, if the dough is thoroughly chilled before rolling so that it can be handled successfully. Pie crust made by this method should be even more tender than that made by the other method, since with hot water there is less development of the gluten.

PIE FILLINGS

There are many kinds of pie fillings and many variations of each kind. The principal kinds, with a few variations, will be discussed here.

Cream Pies. Since the making and baking of a pie shell for a cream pie has already been discussed (p. 276), cream pies will be taken up first. Cream-pie fillings are usually made on the basis of a "cheap" or French custard, that is, the thickening of the liquid is accomplished with the use of both starch and egg. The starch may be flour or corn starch and either the whole egg or egg yolk may be used. In most cases the yolks are used in the filling and the white for meringue for the top of the pie.

The filling must be stiff enough so that it will not run out of the crust when the pie is cut and served. To help in working out basic proportions and methods of combining ingredients for cream-pie fillings, the student should review the thickening power of starch, flour, and egg. Also, one must be sure of the proper method of combining and cooking starch and egg in liquid.

Proportions for a basic cream-pie filling consist of 2 cups whole milk, 1 cup sugar, 6 tablespoons all-purpose flour (or half as much cornstarch), $\frac{1}{4}$ teaspoon salt, 3 eggs, and 1 teaspoon flavoring. Part cream may be used or butter or margarine may be added, 1 to 2 tablespoons. Heat the milk in the double boiler. Mix well the sugar (reserving 6 tablespoons for the meringue), starch, and salt, and pour the hot milk over them. Return to the inside vessel of the double boiler and cook directly over the heat until the mixture reaches a hard boil, stirring constantly. Remove from the heat. Pour a small amount of the mixture over the beaten yolks, stirring vigorously. Combine with the remaining mixture, return to the double boiler, and cook over hot water (not boiling) while stirring. If butter or margarine is added, it should be added when the eggs are thickened. Then remove from the hot water. The filling should cool to room temperature before the flavoring is added.

Before the filling is put into the baked pie shell, it should be beaten to give it a soft creamy consistency. Top the pie filling with a meringue made from the egg whites. (See page 324.) There are many variations of this basic cream-pie filling.

Banana Cream Pie. One to two medium-sized bananas are peeled and sliced and added to the basic cream filling before it is placed in the shell or sliced into the shell and covered with the filling.

Any fruit may be added to a cream pie. If it is a juicy fruit which has a tendency to thin the filling, the amount of thickening in the filling should be increased.

Coconut Cream Pie. About $\frac{1}{2}$ cup coconut may be added to the basic filling, and 2 tablespoons added to the meringue or sprinkled on top of the meringue.

Butterscotch Pie. Use brown sugar in place of the white sugar called for in the thickened portion of the basic recipe for cream pie, and add at least 2 tablespoons butter or margarine, or part of the white sugar may be caramelized. (See page 35.)

Chocolate Pie. Melt two squares (two ounces) bitter chocolate in the milk as it heats, increase the sugar by 2 tablespoons, and reduce the flour about 2 tablespoons so that the mixture will not be too stiff.

Lemon Pie. Lemon-meringue pie is one of the favorite cream pies, but presents special problems. If made with milk, the lemon juice tends to curdle the milk. This can be prevented by thickening the milk with the starch and cooling the mixture before the lemon juice is added. Since a clear lemon-pie filling is desired, water is often used instead of milk. Even then the custard portion should be cooked and cooled before the lemon juice is added, to minimize the thinning effect of the acid.

The extra sugar needed with the lemon juice also has a thinning effect. Lemon pie takes about twice as much sugar as most other cream pies; therefore, most good recipes for lemon-pie filling call for approximately twice as much starch as other cream-pie fillings. Since so much starch is needed, usually cornstarch is used rather than flour. With cornstarch and water, the result is a clear filling, which many people like in lemon pie. To provide richness, butter or margarine should be added. The following recipe has been found to give good proportions for lemon-pie filling when properly combined and cooked. More sugar may be desired. That is a matter of taste.

Mix well the starch, sugar, and salt. Add the hot water while stirring constantly and

Lemon Pie Filling (One Pie)

6 tablespoons cornstarch	3 egg yolks
1 cup sugar	Juice of 2 medium-sized lemons (6 tablespoons)
$\frac{1}{4}$ teaspoon salt	Grated rind of 1 lemon
$1\frac{1}{2}$ cups hot water	$1\frac{1}{2}$ to 2 tablespoons butter or margarine

bring the mixture to a hard boil for at least one minute. Or the starch, sugar, and water mixture may be cooked in the double boiler for 15 to 20 minutes, with frequent stirring. Remove from the heat and cool slightly before adding the beaten yolks. Cook these over hot water (not boiling), stirring constantly. When the yolks are cooked, remove the mixture from the heat and add the lemon juice, grated rind, and butter or margarine. (It is easier to grate lemon rind before cutting the lemon.) Then cool, chill, beat, and place in the baked pie shell, and top with meringue. While this is the usual lemon-pie filling, the filling may be made on a true custard basis, no starch being used. Review custards and work out a recipe for lemon pie using no starch.

Most cream pies are topped with meringue, made from the same number of egg whites as there are yolks used in the filling, varying from two to four.

Meringue for Pies. The type of meringue used to top cream pies is made with approximately 2 tablespoons sugar to each egg white. One-eighth teaspoon salt should be added to each white and the whites beaten until they are foamy. The sugar is then added gradually, and the beating continued until the mixture is stiff enough to hold its shape. It should be spread immediately over the pie filling, care being taken to make the meringue touch the crust around the edge of the pie. The meringue is then set and the peaks delicately browned in a slow oven. This requires about 20 minutes at 300° F.

Meringue for a Pie · The meringue should cover the filling and touch the side crust.

Good meringue is tender and cuts easily without pulling off the pie as it is served. Shrunken or tough meringue, which is difficult to cut, has been cooked at too high a temperature. (Review the chapter on egg cookery.)

Custard Pies. Custard pie is simply a custard baked in a pie crust instead of in custard cups or a baking dish. Other than proper baking of the custard, the only special problem is the prevention of a soggy crust. One method of doing this is to use about one tablespoon of the egg to "paint" over the inside of the pie crust, using a pastry brush, after the crust has been fitted into the pan. Then set the crust by placing it in a hot oven, 450° F., for about three minutes. The crust should then be removed from the oven, filled quickly with the freshly made, warm custard, and returned to the oven at 425° F. for 10 minutes. The temperature should then be lowered to 325° F. until the custard "puffs" and a knife inserted into it comes out clean (about 30 minutes).

Basic proportions for a plain custard filling for an eight-inch pie are these: two cups hot milk, 2 or 3 eggs, $\frac{1}{4}$ to $\frac{1}{2}$ cup sugar, and $\frac{1}{8}$ teaspoon salt. One teaspoon vanilla and $\frac{1}{8}$ teaspoon nutmeg or cinnamon may be added if desired. The milk may be scalded in the double boiler. The eggs should be beaten only until well blended, and the sugar and salt added to them. Then the hot milk is added slowly to the egg-sugar mixture with constant stirring. The filling is poured into the pie crust. The spice is usually sprinkled on top. The pie is baked according to the directions given above. Remove the pie from the oven the instant the custard is done. Set on a cake rack to cool before serving. This requires three to four hours at room temperature.

Custard pie may be flavored in various ways. Honey or maple sirup sometimes is used in place of all or part of the sugar. Since these sirups are liquid, the egg should be increased accordingly.

Coconut Custard Pie. To a plain custard-pie filling, about ¾ cup shredded coconut may be added for an attractive variation.

Pumpkin Pie. Pumpkin pie is really a pumpkin custard, flavored with brown sugar and spices and baked in the same way as plain custard pie.

The following are basic proportions for pumpkin pie:

Pumpkin Pie

2 medium-sized eggs
1 cup canned or cooked pumpkin
¾ to 1 cup brown sugar
¼ teaspoon salt
1 tablespoon hot water
¾ teaspoon cinnamon
¾ teaspoon ginger
1 cup milk or milk and cream
Other spices, as desired (nutmeg, cloves, allspice)

Beat the eggs and add the pumpkin, brown sugar, and salt and mix well. Add the hot water to the spices and mix them into the egg-sugar-pumpkin mixture. Fill an unbaked pie crust and bake in the same way as any other custard pie.

When it is desired to flavor pumpkin pie with orange juice, honey, or some other sirup, the milk must be decreased or the egg increased accordingly.

Sweet-potato and squash pies are made in exactly the same way as pumpkin pie.

Very Rich Pies. There is a group of very rich pies made on a custard basis or by using both egg and starch. In many of these pies the liquid is a sirup or molasses. The well-known pecan pies of the South are typical of this group. The following recipe for pecan pie is basic and may be varied considerably:

Pecan Pie

3 eggs
2 tablespoons sugar
2 tablespoons flour or
1 tablespoon cornstarch
2 cups dark corn sirup
1 teaspoon vanilla
¼ teaspoon salt
1 cup pecan meats

Half honey may be used in this recipe, or all honey, omitting the sugar. With a less concentrated sirup, such as maple, an extra egg (or 2 more tablespoons flour) would be needed, and the sugar could be omitted.

The eggs should be beaten until they are light, since they serve not only as thickening but also as leavening. Mix the sugar with the flour or starch, add to the beaten eggs, and beat together. Then the sirup, vanilla, salt, and pecans should be folded into the mixture. Pour this rich filling into an unbaked pie crust and bake at 375° F. for 45 minutes.

Such very rich pies are often cut into eight servings rather than the usual six.

Chiffon Pies. The simplest kind of chiffon pie is really a soufflé. (See page 107.) Stiffly beaten egg whites or a meringue (at least 3 whites) are folded into the warm filling, either a very thick custard or any good cream-pie filling. Then the baked shell is filled and the mixture cooked in the oven at 325° F. for about 20 minutes, as a soufflé is cooked or a meringue is set on top of a regular cream pie. A slightly higher temperature can be used for cooking the chiffon pie than for meringue, since the egg white is more protected from the effects of the heat when folded into the custard or cream filling.

Basic Recipes. Any of the basic recipes for cream pies given above may be used for making chiffon pies of this kind. Lemon chiffon, butterscotch chiffon, and chocolate chiffon are favorites.

A basic recipe for a custard-soufflé kind of chiffon pie follows:

½ cup hot liquid
(If lemon chiffon, ¼ cup hot water and ¼ cup lemon juice)
3 to 4 egg yolks
½ cup sugar, or less
3 to 4 egg whites
⅛ teaspoon salt
½ cup sugar
Flavoring if desired

Make a very thick custard of the yolks, ½ cup sugar, and the liquid, cooking it in the double boiler until thick while stirring constantly. Remove from the heat and add flavoring, if needed. (None is needed in lemon-chiffon pie.) Make a meringue of the whites, salt, and remaining ½ cup sugar, and carefully fold the custard and meringue together. Then fill the pie shell with the fluffy mixture. To set the filling, place the pie in a 325° F. oven for about 20 minutes.

The souffle chiffon pies also are called "fluff pies," as lemon, chocolate, or butterscotch fluff pie.

The other kind of chiffon pie has a gelatin filling. A soft custard is set with gelatin. Stiffly beaten egg whites are folded into the mixture for lightness, but the whites in this case are not cooked. The following proportions are basic for chiffon pies made with gelatin:

1 tablespoon gelatin
¼ cup cold water
4 eggs, separated
½ to 1 cup sugar
¼ teaspoon salt
½ cup liquid to 1½ cups fruit and liquid
Whipping cream if desired

Soak the gelatin in the cold water. Beat the yolks slightly. Add half the sugar and the liquids and cook over hot water, stirring constantly until of thick custard consistency. Add the softened gelatin and stir until dissolved. Chill. Beat whites after adding salt and beat in the remaining sugar to make a meringue. Fold into the custard-gelatin mixture when it begins to congeal. Pour into the baked shell and place in the refrigerator to harden. Just before serving, top with whipped cream if desired.

This kind of chiffon pie is sometimes called "sponge pie" or "refrigerator pie."

Fruit Pies. The typical fruit pie in this country is a two-crust pie, with the filling and crusts baked together. The top crust may be solid, or it may be a criss-cross or latticed top made by weaving narrow strips of pastry across the pie to form squares or diamond-shaped openings. The fruit used may be fresh, defrosted frozen, cooked fresh, cooked dried, and canned.

Basic Proportions. For a nine-inch pie, about 4 cups uncooked fruit are needed, since the fruit shrinks in cooking. With cooked or canned fruit, 3 cups or less of drained fruit are sufficient. The amount of sugar needed depends upon the tartness of the fruit. One cup of sugar is an average amount for uncooked or unsweetened fruit, but tart apples and cherries frequently need 1½ cups. Gooseberries need still more. Some sweet fruits, such as ripe peaches or canned fruits with some sugar added, will require less than 1 cup.

Most fruit pies should have a small amount of thickening, whether the fruit is fresh, frozen, or canned; yet there must be plenty of juice and it should not be too thick. Apples seldom need thickening, never over 1 tablespoon of starch to a pie. To 4 cups fresh or frozen juicy fruit, 2 to 3 tablespoons cornstarch or tapioca flour, or 3 to 4 tablespoons flour, are sufficient. This may be mixed with the sugar and both combined with the fruit. Tapioca flour or cornstarch gives a beautifully clear, natural-appearing juice. Many people like the flavor of wheat flour, but the juice is opaque, not clear, when wheat flour is used. When using cooked or canned fruits, to 3 cups of drained fruit, use at least $\frac{3}{4}$ cup juice. Mix the sugar with the starch or flour, add the juice, and bring to a hard boil. Pour the thickened juice over the fruit. It may be cooling while the crust is being made.

A few grains of salt always improve the flavor of fruit. With some fruits, such as apples, spices (nutmeg or cinnamon or both) may be added. About 1 teaspoon of cinnamon and $\frac{1}{8}$ teaspoon of nutmeg are average amounts to one pie. The salt and spices may be combined with the sugar. Butter or margarine improves the flavor of most fruit pies, about 1 tablespoon to a pie. It may be dotted over the top of the pie before the top crust is put on.

Special Points on Method. One of the problems in making fruit pies is to prevent the juice from boiling out in the oven. There are a number of ways to prevent this. One is to seal in the juices. To seal in the juices of the pie, use a little more dough for the bottom crust than for the top. Roll it to one-eighth inch in thickness and large enough so that it will extend well over the edge of the pie pan after it is fitted gently into the pan. No air should be left between the crust and the pan and there should be no break in the dough. Using scissors, cut off the lower crust one-half inch beyond the edge of the pan.

Then roll the top crust. It may be less than one-eighth inch thick. Using a piepan of the same size as the one which the crust is in, cut the top crust exactly the size of the top of the pan. Cut holes or gashes for the escape of steam. These holes may be made as decorative as possible, using a paring knife, pastry jagger, or other cutter.

After the bottom crust is filled with the fruit filling, roll the top crust as quickly as possible onto a rolling pin and off onto the filled pie. The extra half-inch of bottom crust is now turned over onto the top crust to seal the edges and prevent the escape of juices. Dampening the edge of the top crust before folding the bottom crust over will help to seal the edges. This double edge

Making a Fruit Pie · (*Lower left*) The top crust, rolled thin and cut just the size of the pan, is folded, to cut gashes for the steam to escape. (*Upper right*) Place carefully over the fruit filling in the lower crust and fold the wide edge of the lower crust over the top crust. (*Lower right*) The edge is fluted with the fingers, to seal in the fruit juices

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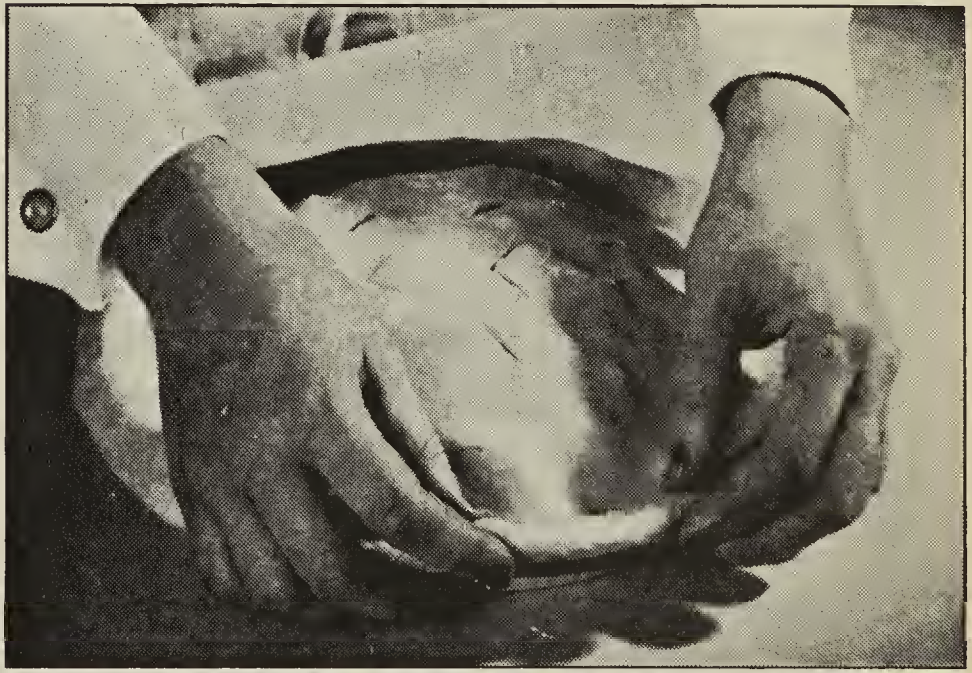
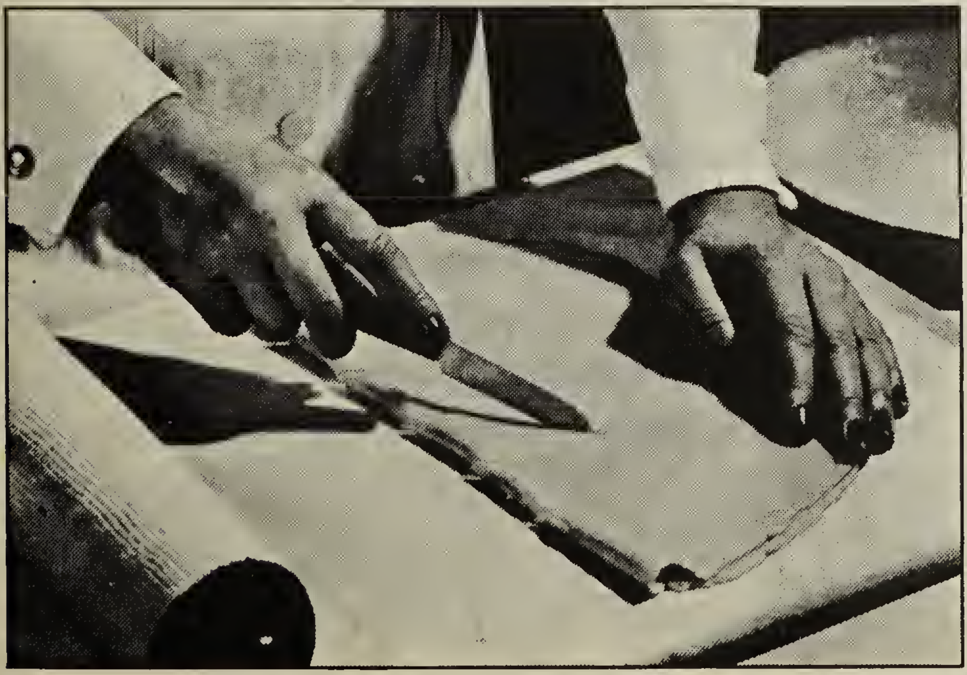
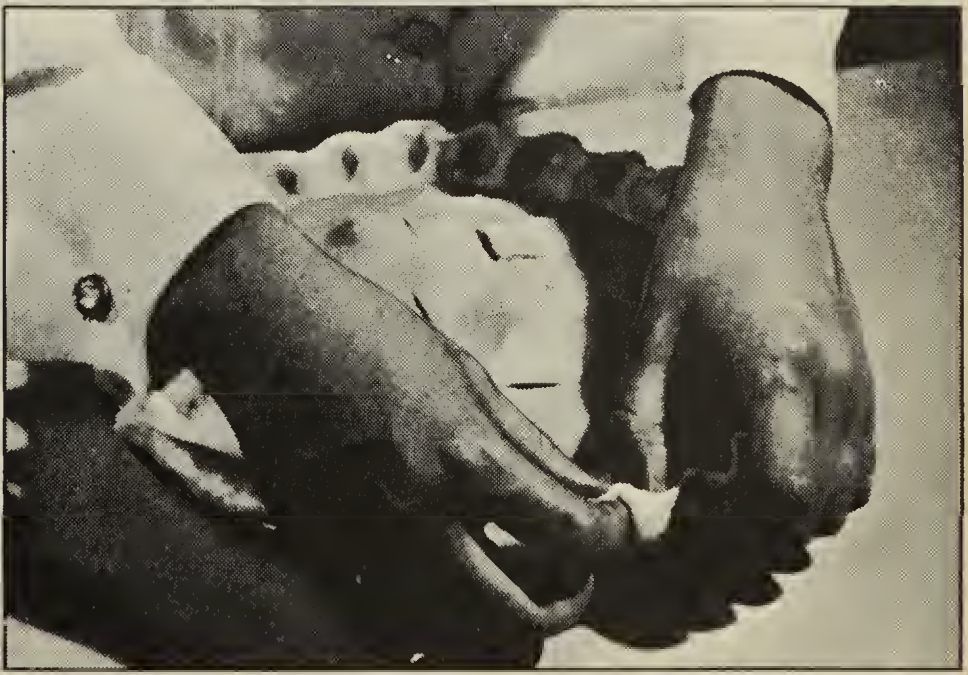






which has been sealed may be crimped with the tines of a fork or fluted with the fingers. This helps to make a good seal. Also, if a double edge is used and made to stand erect like a collar before fluting, it is doubly hard for the juices to escape. Using the thumb and forefinger of each hand, with the left hand inside the collar and the right hand outside, fit the two thumbs and two fingers together to make fluting. Repeat this all the way around the pie.

The pie is then ready for baking. Proper baking temperature is another important point in preventing the juices from boiling over. The pie should be placed in the center of the oven, which has been preheated to 425° F. Bake until the crust is delicately browned and the fruit tender. This will require 35 to 40 minutes.

For a criss-cross or latticed-top pie, prepare and fill the bottom crust exactly as for the solid top, cutting the bottom crust off one-half inch beyond the edge of the pan. The rest of the dough is rolled to one-eighth inch thickness and cut in strips three-eighths inch wide. (There are pastry wheels which will cut these strips, both sides at once with scalloped edges, or a paring knife may be used.) Lay the strips across the pie, alternately, weaving over and under. When the strips are laid diagonally, the openings are diamond-shaped; if straight across, they are square. If desired, the strips may be twisted. With scissors, cut off the ends of the strips just inside the pan and pinch them into the edge of the lower crust. Make a fluted edge to the pie by doubling the half inch of extra dough back onto the lower crust. Stand up the double edge like a collar and flute with the thumbs and forefingers as for the solid-top pie.

This lattice-top pie is more likely to cook out than the solid-top pie just described. For this reason it should be watched during baking and if it shows any symptoms of boiling over, the temperature should be lowered quickly to at least 350° F. after baking about 20 minutes at 425° F. A deep piepan also helps to prevent this.

Mincemeat pies, as well as fruit pies, are usually baked with two crusts with either a solid top or a lattice top. While the two crusts are more or less standard for fruit pies, there are many variations of this standard pie.

DEEP-DISH FRUIT PIES. As the name implies, deep-dish pies are baked in casseroles of any size and shape. There are large deep-dish pies or individual ones. Although this kind of pie may have two crusts, the single top crust is more usual. The crust may be made of pastry or of rich biscuit or shortcake dough.

"DUTCH" FRUIT PIES. These fruit pies are baked in a single crust. Dutch apple pie is the one of this group most often made. Plain pastry is used for the single (bottom) crust. The dough may have a fluted edge, as desired. The apples are cut in attractive slices by quartering, removing the core, and slicing each quarter into four slices. Usually more butter or margarine is used than in the standard fruit pie, 3 to 4 tablespoons. This is melted in a saucepan, and the apples are added and tossed about until every slice is coated with fat. The sugar and spices are then added to the apples and distributed through them. The apple slices are then neatly arranged in the pastry-lined pan, so that the slices fit together compactly. They should be slightly heaped in the center.

When the apples are particularly hard, the pie may be covered with another piepan after the crust is browned. The baking temperature may be reduced from 425° to 325° F. and the baking continued until the apples are tender.

If desired, Dutch apple pie may be covered with streusel topping before baking, in which case a cover is not needed. Streusel topping is made of equal measures of fat (butter or margarine would give good flavor) and brown sugar, with twice as much by measure of flour. Three-fourths cup flour is plenty for one pie. Three-fourths teaspoon cinnamon may be added. The flour, cinnamon, and sugar are sifted together and the fat cut into the dry ingredients as in making pastry. The crumbly mixture is sprinkled over the top of a single-crust pie before baking.

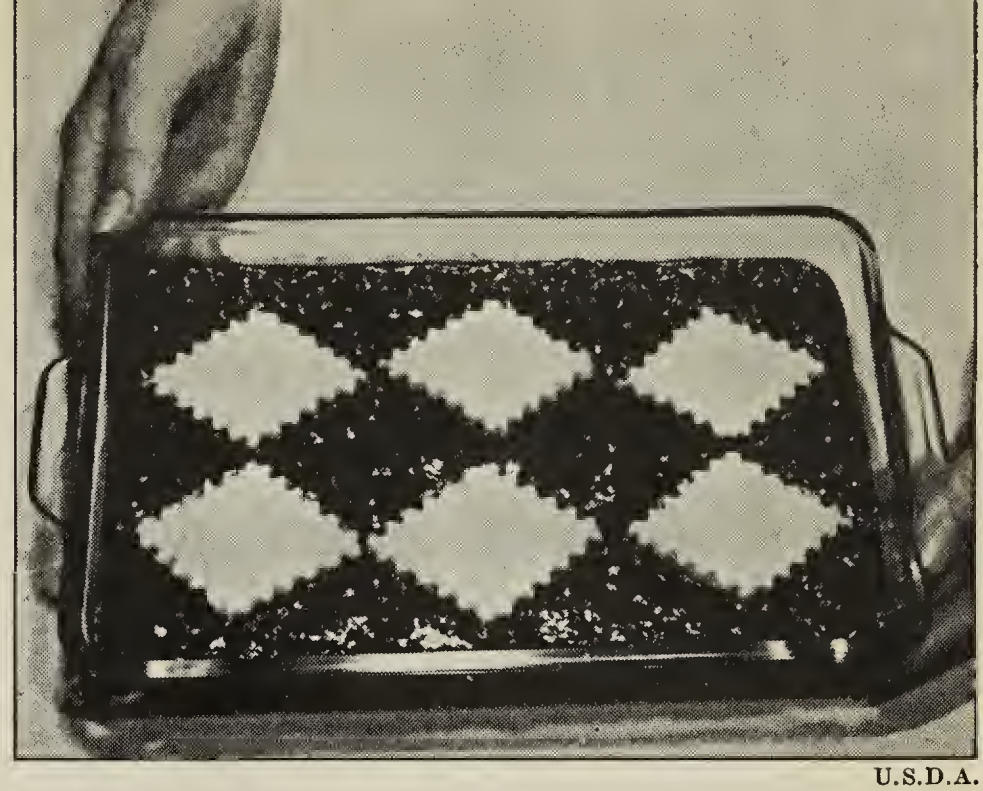
Other Kinds of Pies. There are still other styles of pie, as well as other fillings for pies. Some of these follow.

Cobblers. A cobbler is nothing more than a large pie, usually baked in a rectangular pan. One cobbler might make 50 servings, while a standard-sized pie makes five to eight. The same crust, one or two, and the same fillings which are used in standard pies can be used to make cobblers. Cobblers most often have fruit filling, though other fillings may be used.

Tarts. While cobblers are the largest pies, tarts are the smallest. Tarts are individual or very small pies with either one crust or two. Small amounts of pastry that are left over may be baked in individual pie tins, in muffin pans, or in small forms, or squares. Tarts may be served as dessert, or the very tiny ones with tea. Baked shells may be filled with fresh, cooked, or preserved fruits. Also cream pies, chiffon pies, custard pies, and fruit pies all may be prepared as tarts.

Turnovers. Turnovers also are individual or small pies. They consist of squares or rounds of plain pie crust, filled with fruit, mincemeat, creamed meat, chicken, or fish mixtures, folded, and the edges sealed, envelope fashion. They are baked like any other pie. Sometimes a sauce is served over a turnover.

Meat Pies. The standard meat pie is a stew, meat or chicken and vegetables (see page 203), with a top on it. It may have a bottom crust, though this is not common. The top may be made of plain pastry, puff paste, rich biscuits, shortcake, mashed potatoes, or cereals.



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A Cobbler · A cobbler may be served with pastry cutouts instead of a top crust

OTHER USES OF PLAIN PASTRY

While plain pastry is used chiefly for pie crust, there are other uses to be made of it. Some of these are pastry cases, fruit dumplings, and cheese straws.

Pastry Cases. Creamed chicken or turkey and creamed meats and fish are often served in pastry cases. These are also called "patty shells." Although a richer pastry is frequently used for them, they may be made of plain pastry. Pastry cases of plain pastry are no different from individual pie shells. To make them, roll the pastry to one-eighth inch thickness or thinner and cut to fit the outside of individual piepans, pattie pans, or muffin tins. Fit the pastry over the inverted tins, pressing out the air. Prick with a fork and bake the same as pie shells.

Tops for the cases may be made from the pastry, cut with a cookie cutter or biscuit cutter and baked on a sheet.

The pastry cases should be filled with creamed chicken or meat just before serving.

Apple Dumplings · The dough is folded about the whole or sliced fruit

Fruit Dumplings. Dumplings may be made from either plain pastry or puff paste. When plain pastry is used, it is rolled as for pie crust. Peeled and cored whole apples or peeled whole peaches with the stone removed may be used for dumplings, or any fruit desired may be diced. If left whole, fill the center with sugar; if diced, sprinkle with sugar. Add cinnamon or nutmeg, if desired.

Cut squares or circles of pastry large enough completely to cover each whole fruit, or about six inches across for each dumpling of diced fruit. Place the fruit and sugar in the center of each piece of pastry and dot with butter or margarine. Moisten the edges of the pastry, gather up, and pinch together, sealing in the fruit. Place in a shallow baking pan. Bake at 425° F. until the pastry is browned and the fruit is tender. If the pastry browns before the apples or other fruits are done, reduce the temperature to 325° F. Whole apple dumplings may take longer to bake than an apple pie, and in most cases the temperature should be reduced after the first 12 to 15 minutes.

Serve hot with cream, hard sauce, or hot lemon sauce.

For variety, fruit dumplings may be steamed instead of baked.

Cheese Straws. Cheese straws or pastry sticks for serving with salads may be made from plain pastry. This is an excellent way of using up bits of left-over pastry. The pastry is rolled to one-eighth inch thick. Grated cheese, and paprika if desired, are sprinkled over half of it. The other half is folded over the cheese and rolled again. This may be repeated several times. Finally, the pastry is rolled to one-eighth inch thick, and cut in strips about three-eighths inch wide and finger length. These strips may be left as they are or twisted or braided. Bake on a cookie sheet at 450° F. five to eight minutes or until golden brown. Serve hot or cold. These are delicious with fruit salads.

PUFF PASTE AND ITS USES

There are varying degrees of richness in pastry, from plain to very rich. Plain pastry has from one-fourth to one-third as much fat, by measure, as flour. A rich pastry has from one-third to one-half as much fat, by measure, as flour. Puff paste is not only the richest of all pastries but it is also the lightest, owing to special manipulation of the ingredients.

Ingredients and Proportions. To each cup of flour used for making puff paste, the standard is one-half as much cold, hard fat, by measure, or equal weights of flour and fat. Ice water is the liquid used. From one-fourth to one-third as much water, by measure, as flour is needed to make the puff paste as light as it should be.

Pastry flour gives a more tender puff paste than bread flour, though the latter may be used. Any good shortening will be satisfactory. Because of its flavor, butter or margarine is preferred by some. Equal amounts of one of these fats and a fat of higher shortening value, such as lard, make an excellent puff paste, the one fat for flavor, the other for shortening value. When butter or margarine is used, working it in cold water and then working out all the water makes it waxy and more pliable, and therefore better for making puff paste.

Lightness of Puff Paste. Puff pastry should be very light and puffy. The factors determining lightness are the amount of fat, the amount of water for steam formation, and the way in which the fat is combined with the other ingredients.

Method of Mixing. When the proportion of fat in pastry is increased above one-third cup to each cup of flour it is difficult to add the desirable amount of water if all the fat is cut into the flour; therefore, as higher proportions of fat are used, only a part of it (one-fourth to one-half) is cut into the flour. Then the water is added to this as before and the dough is rolled into a rectangle. The remaining portion of cold fat is then shaved thin and some of it is placed over the rectangular piece of dough. The top and bottom edges of the dough then are turned toward each other until they meet in the center. Then the two ends are turned toward each other until they meet. The dough then is folded once more in the center, making eight layers. It is rolled out again into a rectangle, dotted with fat, folded as before, and rolled. This is repeated until the fat is all used.

There are other ways of mixing rich pastry, but this is one of the easiest. The work of making such pastry should be done in a cool place and all the ingredients kept thoroughly chilled. If the fat tends to become soft, the pastry should be chilled between foldings. It is best to take precautions to insure the layers of fat and dough being kept parallel. When the pastry is used, roll so that the layers of fat are parallel with the canvas or board. In gathering up the scraps, put together in parallel layers.

Uses of Puff Paste. Puff pastry may be used in any of the ways that plain pastry is used, except as the under crust of full-sized pies. It is too tender to support the weight of the pie filling. It may be used for the top crust of all kinds of two-crust pies, for tarts, turnovers, pastry cases, patty shells, fruit dumplings, cheese straws, and as the basis for many French pastries. Its greatest use is for making patty shells and French pastries. For the latter, consult a reliable cookbook for cream horns, Napoleons, and various types of tarts and tartlets.

PATTY SHELLS. Cases or shells for serving various creamed chicken or meat dishes and for dessert fruits are made from puff paste, as well as from plain pastry. To prepare these, roll chilled puff paste to one-fourth inch thick. Cut out rounds of any desired size for individual servings, usually about three inches in diameter. If desired, a fluted cutter may be used. Cut a hole about two inches in diameter from the center of half of the rounds. Using a spatula, place the solid rounds on a baking sheet covered with brown paper. With a pastry brush, dampen the edges of the rounds with cold water. Top each solid round with one of the rings of paste. Press down very lightly with the spatula. If desired, the tops may be brushed gently with egg yolk, diluted with a tablespoon of cold water. Chill in the refrigerator 20 to 30 minutes. Then bake at 425° F. for about 25 minutes. After the first two or three minutes of baking, the patty shells should be covered with a sheet of heavy paper.

Small solid rounds, about an inch and a half in diameter, may be cut and baked for tops, if desired.

MERINGUES AND THEIR USES

There are three kinds of meringues, but the essential ingredients are the same, beaten egg white and sugar in some form. To these chief components other ingredients may be added to improve flavor and texture. It is

Poultry and Egg National Board

Macaroons · Small, crisp, crunchy meringues with nuts added are a cross between a cookie and a confection

possible to have a wide variation in the proportion of the essential ingredients and this variation accounts chiefly for the differences in the three kinds of meringues. There is a difference, too, in the way the meringues are cooked.

The first kind of meringue, sometimes called a *soft meringue*, makes a light, fluffy top for pies and puddings. Basic proportions are from 1 to 3 tablespoons sugar to each egg white. Honey, sirup, or jelly may be used in the proportion of 1 tablespoon per egg white. Meringue for pies already has been discussed in this chapter.

Meringue for puddings is the same as for pies; however, it may be cooked differently. On a baked pudding, the meringue may be cooked or set in a slow oven, exactly as for pies. It also may be steamed and transferred to the pudding. For floating island, islands of meringue on top of a soft custard, it may be steamed on top of the custard itself. Or it may be steamed over hot water and transferred to any pudding.

The second kind of meringue, called "hard meringue," has a wide variety of uses. It is made with a high proportion of sugar, at least 4 tablespoons to each egg white. It is baked slowly until dry, or rather it is dried in the oven. The large amount of sugar and the long slow baking give crisp crunchy products in contrast to the light fluffy tops on pies and puddings.

The third kind of meringue is better known as "cake icing." It is used also to give a special fluffy texture to certain candies. This kind of meringue is discussed under special texture candies on page 43; and again under cake icings on page 305.

The crisp crunchy meringues are discussed here. They include certain small cakes used for tea and dessert, called "small meringues," "kisses," or "macaroons"; they include also meringue glacés, meringue shells, and tortes for holding ice creams, fruits, and cream or custard fillings.

Basic Proportions. Basic proportions for the crisp or hard meringues are these: to each egg white, $\frac{1}{4}$ cup sugar, a few grains salt, and $\frac{1}{16}$ teaspoon cream of tartar. The salt is needed for flavor and it also increases the volume of the beaten white. Cream of tartar (acid) increases the stability of the meringue and makes the egg white coagulate more quickly in the oven. (See angel-food cakes on page 107.)

Flavoring may be added to meringues, as desired, about $\frac{1}{4}$ teaspoon vanilla or other extract to each egg white. Many additions are used to give variety.

Method of Mixing. To give best results, egg whites for any kind of meringue should be at high room temperature before beating —82° to 86° F. is optimum. The whites are beaten until frothy and the salt and cream of tartar sprinkled over them. The beating is continued and the sugar added gradually during the beating. The flavoring is put in with the last of the sugar. The various additions are carefully folded in last.

The meringue is shaped with a spoon or pastry bag into the desired size and shape, usually on a baking sheet covered with unglazed paper. Meringues are baked at from 225° to 325° F. from 15 minutes to an hour or longer until very delicately browned and dry on the surface. (The very low temperatures require the long baking times.) These differences in temperature and time of baking vary with the size of the meringue and the additions to the essential ingredients.

Small Meringues. Small meringues, sometimes called "meringue kisses" or "macaroons," are made by dropping the meringue by teaspoonfuls onto a baking sheet covered with brown paper. Bake at 275° F. for 15 to 30 minutes. There are many variations of these small meringues.

Coconut Kisses. Shredded coconut is added to the basic meringue in approximately the same measure as sugar.

Nut Macaroons. Finely chopped or ground almonds or other nuts may be added to the meringue. When almonds are used, they should be blanched and the skins removed before chopping. Almond flavoring may be added, if desired, or a combination of almond and vanilla.

Nut-Brittle Kisses. In place of the coconut or chopped nuts, crushed nut brittle may be added to the basic meringue.

Cereal Macaroons. Corn flakes or rice crispies may be added to the basic meringue, up to twice the measure of sugar used. Brown sugar may be used in place of white, if desired. Shredded coconut and chopped nuts also may be added to these little cakes. With so much added material to protect the egg white from the heat, corn-flake macaroons may be baked at a slightly higher temperature than other meringues; 300° F. for about 20 minutes is usually satisfactory.

Meringue Glacés. Using a tablespoon, shape basic meringue, usually flavored with vanilla, in large mounds on heavy brown paper on a baking sheet. Bake about 40 minutes at 275° F. When baked, scoop out the centers and dry in the oven. Use as cups for ice cream or fruit, or fruit mixed with ice cream, or whipped cream.

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Meringue Shells · These are made from a hard meringue

Meringue Shells. With a tablespoon or a pastry tube, shape rounds of meringue three or four inches in diameter on brown paper on a baking sheet. The sides of the shells should be built up to a height of about one and a half inches. This can be done by putting several layers of meringue on top of each other with a pastry bag or by shaping the meringue with the bottom of the bowl of a tablespoon. The shells should be baked at 250° F. for about one hour. The shells may be filled with ice cream, or fresh fruit, or ice cream topped with fruit.

Meringue Torte. This pie-size meringue is baked in a buttered spring-pan or is shaped on heavy brown paper with a tablespoon or pastry bag into a round, about one-half to three-fourths inch thick. The sides should be built up to a height of about one and a half inches.

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XXV · Coffee, Tea, and Cocoa

The three beverages which are important from the standpoint of their preparation are coffee, tea, and cocoa or chocolate. All these contain a stimulating principle which, in addition to the flavor, contributes to their popularity. Maté is a fourth, containing the same stimulating principle, but it is less widely known and used than the other three. They all differ so much in origin, composition, and method of preparation that they are discussed separately.

COFFEE

Coffee is one of the most popular beverages in the world, and certainly the most popular in the United States. It is obtained from the fruit of an evergreen shrub, *Coffea arabica*, and related species. It is believed that coffee was discovered in Arabia about 1200 years ago and that it was introduced from Arabia and Abyssinia into the East and West Indies and tropical America.

Coffee Shrub · This one, about three years old, is unusually well filled with berries

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The people of the United States are the world's greatest coffee-drinkers, having consumed more than two and one-half billion pounds in 1946. More than 94 per cent of the homes in the United States serve coffee at least once every day, using over half the world's supply and spending more than $300,000,000 a year for it. The per capita consumption of coffee in the United States is increasing. It was 15.7 pounds in 1941 and rose to 19 pounds in 1946.

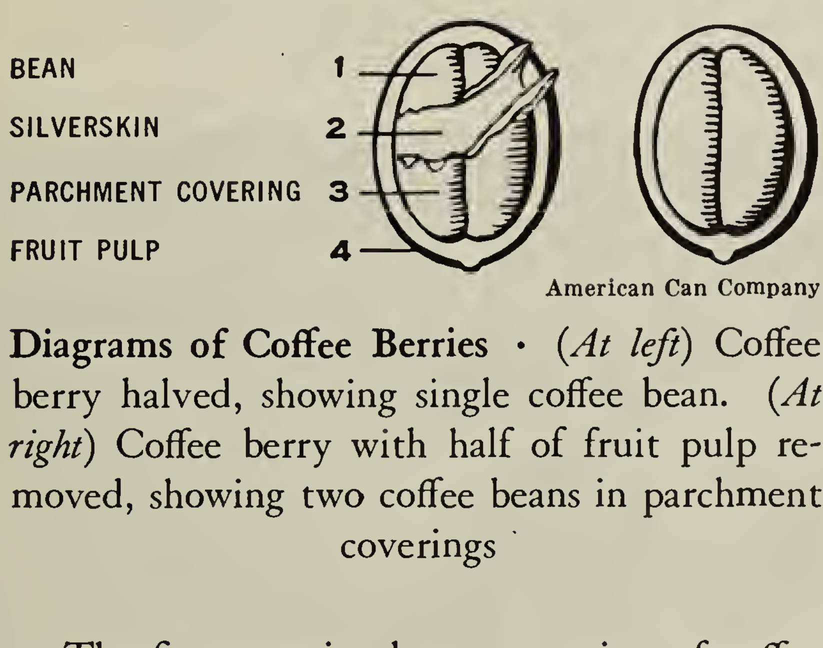
Kinds of Coffee. Some coffees are named from the localities where they are produced, or the port through which they are shipped, though this is not always the case.

Well-known kinds of coffee are the Mocha and Java, Rio, Maracaibo, and Bogotá. In the trade, coffees are classified broadly as Brazils (chiefly the Santos and Rios) and Milds (outside of Brazil). Some of the least expensive coffees are low-grade Rios and the most expensive are high-grade Javas or East Indian Mochas. Mocha is the highest quality of Arabian coffee. Mocha and Java acquired a popular reputation many years ago, and for a long time many merchants regarded one-third Mocha and two-thirds Java as the ultimate in coffee perfection. The term "Java," however, has been abused, and while real Java is rare, it is not greatly superior to other kinds. Western blends are considered just as good as Eastern ones.

Brazil furnishes over half the world's supply of coffee and three-fourths of that used in the United States. Other coffee-producing countries are Colombia, Venezuela, Central America, Mexico, and the Netherland East Indies. Coffees grown in these countries have their characteristic flavors, which the roasting modifies and enhances.

All the coffee imported to the United States is shipped in as "green coffee" and is roasted and blended here. Much coffee enters this country through the port of New Orleans and a great deal is roasted there. One of the many things which characterize that famous city is the ever-prevailing aroma of roasting coffee.

Preparation for Market. Many steps are involved in the preparation of coffee for the market. Each berry normally contains two coffee beans. A few, which are male berries, are rounded in shape and have only one bean to a berry. These are called peaberries. The beans are enclosed in a parchment-like cover and the pulp of the berry.



American Can Company

Diagrams of Coffee Berries · (*At left*) Coffee berry halved, showing single coffee bean. (*At right*) Coffee berry with half of fruit pulp removed, showing two coffee beans in parchment coverings

The first step in the preparation of coffee beans is the removal of the pulp. This may be done either by mechanical means or by soaking.

The next step is the fermentation, which helps to develop the proper flavor in the berries and reduces the sugar present. After fermentation, the beans are washed and dried, then cured while still in the parchment lining.

After curing, the hulls are removed. Then the beans are put through a machine which removes all foreign material and sorts them according to size. In this form the coffee is shipped. The green beans have a yellowish-green color which deepens with the age of the coffee.

Coffee must be roasted before it is ready for use. This may be done by the distributor, or by the retailer if he has a large coffee trade. Roasting is an extremely important step in the preparation of the coffee bean. Green coffee has little aroma and flavor. Proper roasting develops the full aroma and flavor, and influences the physiological effects of the coffee. Changes in the fat content of the bean cause the formation of *caffeol*, the volatile oil that gives coffee its aroma and flavor. Carbon-dioxide gas is developed along with the caffeol.

The color of the coffee changes during roasting from green to brown, because of the formation of caramel from the sugar in the bean. The color is determined by the amount of caramel formed and this varies with the temperature and time of roasting. There are "light" roasts, "medium" roasts, "high" or "dark" roasts, and Italian or French roasts, with colors varying from cinnamon to chocolate brown. Coffees from different sources are usually blended before being placed on the market, but this should not be done before roasting, since the different coffees need to be treated differently during the roasting process.

Composition and Use. The composition of the coffee berries is of little interest, but that of a cup of coffee is of importance to those who prepare or drink it. The beverage contains only the portion of the bean which is soluble in water. The quality of a cup of coffee is determined not only by the kind of coffee, but by the way it is handled, the temperature at which it is roasted, in what condition and for how long it is stored, to what fineness it is ground, and last, but not of least importance, how it is made.

The substances which are present in varying amounts in a cup of coffee are tannin, caffeine, caffeol, caramelized carbohydrates, and carbon dioxide. The characteristics of these substances will determine the quantities of them which are obtained from various methods of handling and preparing coffee.

The tannin in coffee, and also that in tea, is slowly dissolved in hot water. The amount which goes into solution depends upon the length of time the water and coffee are in contact with each other and upon the temperature of the water. It is more soluble at the boiling temperature than just below boiling.

Caffeine is the alkaloid which gives the stimulating quality to coffee. The average cup of coffee, as made in the United States, contains from 1.5 to 1.75 grains of caffeine. This alkaloid is very soluble, about 80 per cent of it being removed in the first two minutes of extraction, and is as soluble just below boiling as at boiling temperature.

The flavor of coffee is due principally to the volatile oil, caffeol. This escapes during storage, particularly when the coffee is ground; and during brewing, it escapes quite rapidly and completely if the extract is boiled. The caramelized sugar gives color and some flavor. Carbon dioxide gas, generated in the roasting, also improves the flavor. It is released rapidly when the coffee is wet, and completely at boiling temperature.

The popularity of coffee is due to its flavor and stimulating qualities. Any food value which it contributes comes from the sugar and cream or milk used with it. The caffeine acts as a stimulant to both mental and muscular activity. Coffee is useful, therefore, in times of emergency when a person's reserve of energy must be drawn

Grading Coffee Beans · The dried coffee beans are cured, cleaned, and sorted for size. In this picture the coffee is being sorted by hand

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upon. One should not come to depend upon it, however, to too great an extent.

Unless a person is specially sensitive to caffeine, any harmful effects of coffee come from the use of a beverage so prepared as to contain excessive amounts of tannin and caffeine, or from the use of too large amounts of coffee, however well prepared. Children are more susceptible to the effects of caffeine than adults, and coffee should never be allowed to replace milk in the diet.

Selection and Buying. Most of the coffee on the retail market has been blended and packaged in one- to three-pound containers, and is sold under brand names. Most coffee now is sold in the bean and ground by the retailer according to the wishes of the consumer. When it is sold ground, it is usually packaged in sealed cans and the date of grinding is shown on the label. Some coffee is "vacuum-packed," by a process which draws out the air before sealing the cover.

Many people select coffee by price, on the theory that an expensive brand must be a good coffee. This is not necessarily true, since tastes in coffee vary a great deal. In general, the high-priced coffees do go further; usually, the higher the quality, the more cups to the pound. But this does not mean the flavor is more to the liking of those served.

Most consumers soon learn the quality and brand they like, and these ordinarily run quite consistently. A good plan to follow for making a wise choice is to begin with the less expensive brands and work up until one is found which gives the flavor desired. If the dealer does not change his combination, one can then safely continue buying the same brand and quality. An inexpensive quality of coffee, properly handled and well prepared, may make a more palatable beverage than a stale poorly prepared but expensive one.

Chicory, roasted and ground, sometimes is added to coffee. In Louisiana, and to some extent in other parts of the country, the addition of chicory is considered an improvement. In other parts it would be considered an adulterant, since some people do not like the flavor. Chicory looks like coffee. When a small quantity of it is added to coffee it makes the brew look darker and appear stronger than the coffee would be without it.

Coffee is a perishable product. In order to have it at its best, one should purchase it in small quantities, so that the supply will last little over a week, if possible. This means that for the small family it should be purchased a pound at a time.

DECAFFEINATED COFFEE. There are at least two well-known brands of decaffeinated coffee on the market. This coffee is available in pound cans. It is of good quality, with nothing added and a large percentage of the caffeine removed. The amount of caffeine remaining depends somewhat on the amount that was present originally. According to the manufacturers, about three per cent of the caffeine is left in this coffee.

SOLUBLE COFFEE. For ease in preparation soluble coffee has been available for a number of years. The quality of this form of coffee improved and its use increased during the Second World War, and it has been gaining in popularity. The emergency rations of the army contained soluble coffee, to save both space and time of preparation. It is sometimes called "instant coffee," since it can be made in an instant in a cup. The number of brands of soluble coffee available has been increasing. Soluble coffee is to be had in tin and glass containers of from two ounces to a pound. Two to four ounces of soluble coffee are equivalent to a pound of regular coffee, making the cost per cup comparable. This form is manufactured by various processes. Some brands contain only the dry coffee infusion while others contain added materials to facilitate drying or for special flavor. Soluble coffee is useful when small amounts of coffee are needed, since the ground product deteriorates rapidly.

Decaffeinated coffee also is available in soluble form.

Care and Storage. Green coffee improves with age, but as soon as it is roasted it begins to deteriorate. The coffee flavor (caffeol) escapes with the gas (carbon dioxide) which was formed in the bean during roasting. For coffee to have its maximum flavor, it should be freshly roasted and ground just before brewing. Most homes of two generations ago had their coffee mills, and the homemakers of those days ground their own coffee each morning. Some hotels and restaurants follow this practice today. The modern homemaker, however, prefers to eliminate that step from her coffee-making. Every precaution, therefore, should be taken to insure the freshness of this perishable product.

When coffee is purchased in paper bags or cardboard cartons it should be transferred to glass or tin cans with tight-fitting lids as soon as it reaches the kitchen. Air is the great enemy of coffee. It has been found that ground coffee stored in paper bags and cardboard containers may lose as much as 65 per cent of its freshness in a week. By the tenth day a disagreeable flavor of staleness is noticeable, which develops rapidly for the next 10 to 15 days. When the quantity purchased will last longer than a week, the tightly closed container of coffee should be kept in the refrigerator. Like any other fat, caffeol, the aromatic oil which gives coffee its flavor, deteriorates on exposure to air, light, and warm temperatures.

Preparation for Serving. In the preparation of coffee the aim is to obtain the maximum in aroma, flavor, and stimulating substance with the minimum amount of the disagreeably flavored tannin, and to have a clear infusion. The presence of even minute quantities of grounds prevents clearness; therefore the method should be regulated so as to bring about the complete separation of grounds and liquid.

Essentials for Good Brew. There are certain essentials which apply to all methods of extraction, if the brewed coffee is to be served at its best. Satisfactory coffee may be made by any of the following methods; but both the drip and the vacuum method are recommended, since they result in a brew with maximum flavor (caffeol) and minimum bitter taste (tannin).

The first essential for good coffee is that the coffee-maker be chosen to suit the needs of those to be served. Any maker gives its best performance when used to capacity, or nearly to capacity. The material of which the pot is made may influence the flavor of the coffee. The caffeine seems to form compounds with certain metals; therefore pots made of glass, porcelain, earthenware, stainless steel, or enamelware are to be preferred. Enamelware should never be used if chipped. Those materials which are heat-proof are easiest to use.

Second, for maximum flavor the coffee must be fresh and ground to suit the method of extraction. Drip or filtered coffee requires a very fine grind; vacuum coffee, very fine or pulverized; percolated coffee, fine to medium; and steeped coffee, a coarse to medium grind.

Third, accurate measurement of both coffee and water is essential for a good brew. Standard measures should be used. The usual proportions are 2 level tablespoons to 1 measuring cup (one-half pint) of water. When coffee is made in large quantities, it is usually weighed for accuracy.

Fourth, the coffee-maker must be absolutely clean, with no stale coffee odor clinging to any part of it. The grounds should be emptied as soon as the coffee is made. After using, the pot should be scrubbed with a brush, soap, and very hot water, rinsed in scalding water, and left unassembled until used again. It should be scalded again when it is assembled for use. When filter cloths are used, they should be rinsed thoroughly in clean cold water and kept submerged in cold water between usings. They should be renewed at least every two weeks.

Fifth, careful timing is important. This varies somewhat with the method and the amount of coffee; the range in time is approximately five to ten minutes. When the water is kept in contact with the coffee too long a bitter brew is the result, since the tannin is dissolved in it. Bitter coffee is not necessarily strong coffee, but it has been poorly made.

Sixth, quick service of the coffee after brewing is essential for hot coffee of maximum flavor. When the brew stands, it loses flavor rapidly; and when the delightful aroma of coffee is detected through the house it has been lost from the coffee itself.

DRIP COFFEE. Drip or filtered coffee is prepared by the old French method of pouring boiling water over finely ground coffee held in a suitable sieve-like container, usually lined with cloth or filter paper. With this method, it is necessary to pour the water through but once, since the largest amount of caffeol and the least amount of tannin are in the first extraction.

After the pot is scalded, the coffee is measured into the top of the pot; the boiling water is measured and poured over the coffee. Then the cover should be put on the pot to hold in the coffee flavor.

The coffee must be kept hot but should not boil. Placing the pot on an asbestos mat over a very low flame or in hot water may do the trick, if the coffee must wait. There are electric heaters with temperature controls for keeping coffee hot without boiling.

VACUUM COFFEE. The vacuum coffeemakers, usually made of heat-proof glass, have two bowls. The upper bowl holds the coffee, and the lower bowl, the water. There is a filter in the bottom of the upper bowl, and there also should be a cover for the upper bowl. Heat is applied to the lower bowl and the pressure generated by the steam formed when the water is heated forces the water into the upper bowl and into contact with the coffee. When the heat is turned off, or the pot removed from the heat, the vacuum that is created in the lower bowl draws the brewed coffee down.

It is best to start with boiling water when using this method. Otherwise, some of the water may be forced up into the coffee before it has reached the boiling point.

PERCOLATED COFFEE. This method of making coffee should result in an extraction below the boiling point. The heated water is forced up the tube of the percolator and sprayed onto the coffee held in the perforated basket above the water. In this way, the soluble materials in the coffee are slowly extracted. At no time is there a large amount of water in contact with the grounds. This should mean that a minimum amount of tannin is dissolved. The constant aeration as the liquid sprays over the grounds, however, may cause some loss of caffeol. Also the heat must be regulated to prevent the boiling of the infusion, with the consequent loss of caffeol and carbon dioxide.

For best results the coffee should percolate slowly, from seven to ten minutes, depending upon the pot used.

STEEPED COFFEE. This is a modification of the old boiled coffee. When coffee is boiled the tannin dissolves and makes the coffee bitter, and the volatile caffeol and carbon-dioxide gas are driven off.

An old-fashioned pot may be used for steeping coffee. The more tightly it is covered, the less the loss of volatile flavors.

The water is measured into the pot and brought to a hard boil. Then the measured coffee is stirred into the water. It should

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Picking Tea Leaves · The tips of the new green shoots make the finest tea. The larger leaves are of lower quality

be allowed to steep over low heat without boiling for seven to ten minutes.

When the coffee is added directly to the water, some means of settling or straining it must be used. The simplest means is to strain it through a very fine strainer as soon as it is finished. Or a small amount of cold water may be added. This lowers the temperature suddenly, the grounds are carried to the bottom of the pot, and the coffee is clear if not agitated to stir up the grounds again. Egg whites may be used to clear coffee. The egg white is added to a mixture of cold water and coffee. As the water heats, the egg is coagulated about the ground coffee, making it possible to separate it by straining. Since the protein of the egg surrounds the particles of coffee, there must be incomplete extraction of flavor with this method.

ICED COFFEE. Good iced coffee requires just as much care in the making as hot coffee. Make the brew at least half again as strong and up to double strength of coffee to be served hot. Use a minimum of 3 level tablespoons of coffee to 1 standard measuring cup of water. Pour the hot coffee over the ice in the glasses. Unless the brew is quite strong the melting ice weakens the coffee too much. For this reason some prefer to make coffee two or three hours in advance, using the same amount of coffee as for serving hot or perhaps slightly more. Then cover tightly and set aside to cool. The cold coffee chilled in the refrigerator requires less added ice.

Ice cubes may be made of left-over coffee for use in iced coffee.

AFTER-DINNER COFFEE. The demitasse or small cup of coffee served after dinner should be made by using half again as much coffee up to double the amount used in the breakfast brew.

CAFÉ AU LAIT. Coffee with milk, or café au lait, also should be made stronger than that which is served with a small amount of cream. Equal amounts of hot coffee and hot milk are poured into the coffee cup. The coffee should be at least half again as strong for this method of serving as for the usual method.

TEA

Tea is prepared from the leaves and leaf buds of the different species of Thea, an evergreen shrub of the Orient. The amount of tea used in the United States is very small compared with the amount of coffee—less than a pound per person per year. In England it can well be called the national beverage, eight to nine pounds per person per year being consumed. The tea used in the United States comes from China mainly, with smaller amounts from India, Ceylon, Japan, Java, Formosa, and Sumatra.

Kinds of Tea. The plant is virtually the same in all the countries where tea is grown, but with variations in the soil, climate, elevation, and methods of growing and cutting, individual flavors and other characteristics result. The main differences in tea are due, first, to the method of treatment and, second, to the maturity of the leaves.

All teas fall into one of three general classes: black or fermented, green or unfermented, and oolong or semifermented. Black and green teas may be prepared from leaves picked from the same plant.

Descriptive names have been given to the leaves of varying maturity. China teas, and those from some of the other countries, usually are designated as follows:

A. Black Teas	B. Green Teas
1. Flowery Pekoe	1. Gunpowder
2. Orange Pekoe	2. Imperial
3. Pekoe	3. Young Hyson
4. Pekoe—Soochong	4. Hyson
5. Soochong or English Breakfast Tea	

Teas from India, Ceylon, Java, and Sumatra are usually black. Those from Formosa are oolong or partly fermented and those from Japan are usually green.

The grades shown above are determined by the size or maturity of the leaves, or the location of the leaves on the stem. For example, the Flowery Pekoe is the smallest leaves and the Soochong the largest or coarsest leaves. Likewise, Gunpowder is the smallest and Hyson the largest leaves of the green teas.

Most of the China black tea sold to the United States is known as "Congou," which is a blend including the Pekoe to the Soochong. The higher grades also may be blends. The flowery Pekoe to Pekoe are usually designated fancy teas. These are sometimes scented with blossoms of other plants, usually chulan blossoms, which have a fragrance similar to that of jasmine.

Preparation for Market. The tea leaves are gathered three or four times during the year, oftener in Ceylon, where there is no winter. The first crop is considered the most desirable and provides the most expensive teas. The second is the more usual tea of commerce. The third and the fourth, in case there is a fourth collection, make up the least expensive teas.

Very soon after collection the tea is placed on copper trays and heated or steamed to wither the leaves. The regulation of this step makes the difference between the green and the black teas. The black teas are heated just enough to wither the leaves and to make rolling possible, but the enzymes are not destroyed. The green teas are heated so as to destroy the oxidizing enzymes but not sufficiently to destroy all the enzymes, for in that case the flavor of the tea is impaired.

The next step is the rolling of the tea leaves. These are rolled with the hands or feet and in some cases by machinery. The purpose of the rolling is to accelerate the drying and increase the ease of extraction of the soluble constituents. At this stage comes the fermentation of the black tea. This is allowed to proceed for several days and brings about quite definite changes in the composition of the leaves as well as in their color.

After rolling of the green, and after fermentation of the black, the teas are dried. This may be accomplished in the sun, but is now effected in many places by means of artificial heat.

After drying, the tea is submitted to a refiring which greatly improves its quality. The optimum temperature for the firing of the green tea is about 158° F. for one hour, while the temperature for black tea is somewhat higher, about 176° F. If these teas are heated to a higher temperature, both color and flavor are impaired.

Composition and Use. With tea, as with coffee, the interest is in the composition of the infusion rather than in the composition of the tea leaves.

The stimulating principle in tea is *theine*, an alkaloid which is identical with caffeine in coffee. The astringent, *tannin* or tannic acid, is an undesirable constitutent which is found in fairly large amounts in teas of the different kinds. It is bitter in flavor and is dissolved slowly in hot water. The amount

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Testing Tea · Standards for tea are established each year by a board of tea experts, working with the Supervising Tea Examiner of the Food and Drug Administration. Samples of all teas are taken at ports of entry for testing. Taste and aroma are important points in these tests

that is present in an infusion of tea can be controlled to a certain extent by the method of preparation of the tea. The amount going into solution depends upon the length of time the water and tea are in contact with each other, and also upon the temperature of the water, since tannin is more soluble at boiling temperature than just below boiling.

There are also essential oils in the tea leaves which give the characteristic aroma and flavor. These are volatile and are lost on boiling. The color is determined by the kind of tea and whether or not it is fermented.

The influence of tea in the diet should be considered in terms of both theine and tannin. In view of the way tea and coffee are made in the United States, a cup of tea of average strength contains about one fourth as much of the stimulating principle as one of coffee of average strength. Tea, however, may be harmful to the digestive tract owing to the astringent tannin, which may be present in large amounts in a cup of tea, improperly made.

The food value of a cup of tea is determined mainly by the constituents which are added. These usually are less than in a cup of coffee, since cream is not added so generally or in such large amount.

It has been found that there are small amounts of vitamin C in some teas, but the amount in a cup of tea is negligible.

Selection and Buying. The selection of tea depends very much upon the flavor which is found most agreeable. Green tea contains tannin in a more soluble form, and less theine than black tea. Indian and Ceylon teas are said to be stronger and to contain more tannin than Chinese teas. Most people in the United States seem to prefer black tea to green. The few who want a strong flavor and color like the black teas from Ceylon and India, and those who prefer lighter infusions prefer tea from China and Japan.

Tea is available on the market in one-fourth-pound, one-half-pound, and one-pound packages. It is also packaged as tea balls, each containing enough tea for one cup or a certain number of cups.

Packages which are airtight lose less aroma and flavor than paper or cardboard cartons.

Care and Storage. Tea loses aroma and flavor on exposure to air, though not as rapidly as coffee. It should be stored away from odors in an airtight container in a cool dry place. To be at its best, tea should not be kept longer than six months even under desirable conditions.

Preparation for Serving. Tea differs from coffee in that there is but one desirable method of preparation, an infusion. The blend is of importance, however, in making good tea, but, as with coffee, the particular kind and blend depend upon personal likes.

If tea is to be made in a pot, a suitable choice of the pot is another essential. Pottery, glass, or porcelain pots retain the heat better than metal, and heat is essential to a good infusion.

Essentials for Good Tea. With the preferred blend and a suitable pot, the following procedure will insure a good cup of tea:

1. Preheat the pot, or the cup if tea is to be made in a cup with a tea bag. The best way to do this is to fill the pot or cup with boiling water, then empty it.
2. Allow one tea bag, or from 1 to 2 teaspoons of tea, for each cup.
3. Pour fresh boiling water over the tea or bag and cover it. Boiling water is the first requirement for good tea. It is even more important than the blend of tea.
4. Let the tea steep from three to six minutes. Then serve at once, plain or with sugar, and either lemon or milk.

If loose tea and boiling water are used the leaves will settle to the bottom and it may not be necessary to strain the tea. Some pots have a straining device.

Iced Tea. There are special blends of tea for serving iced. Tea to be served iced should be made with as much care as that to be served hot. Just as with iced coffee, to allow for dilution by the ice, tea should be made at least half again as strong as for serving hot.

Iced tea is usually best when made by pouring freshly made hot tea over ice in the glass, since the infusion loses flavor on standing. If made in advance and allowed to cool and be chilled before icing, which is more economical of ice, it should be covered closely during cooling to prevent loss of flavor.

When the infusion for iced tea contains too much tannin, there may be a precipitation of the tannin when it is poured over the ice, resulting in an unattractive cloudy tea. A way of preparing iced tea which eliminates this possibility is the cold-water method. The tea is made with double the usual amount of tea, and cold water. The water remains on the tea overnight, or from 12 to 18 hours, and it should be covered tightly and kept in the refrigerator. The tea is strained from the leaves for serving and poured over ice in glasses. Tea made in this way seldom carries any bitterness, since tannin is not as soluble in cold water as the stimulating and aromatic principles. Theine and the flavoring substances are more soluble in hot water than cold, but the difference in the time that the water is in contact with the tea also is a factor.

Iced tea is usually served with lemon, and sugar if desired. When lemon is added the color fades, since a tannin solution loses color in the presence of an acid.

COCOA AND CHOCOLATE

Cocoa and chocolate are prepared from the seed of an evergreen tree, *Theobroma cacao*. When translated, *Theobroma* becomes "food for the gods," an indication of the esteem in which these products were held in early days. The cacao tree is native to Mexico, but it grows also in South America and the West Indies. Cocoa and chocolate differ from each other in that some of the fat is extracted from the chocolate in the manufacture of cocoa. Both may be used in the preparation of beverages, though cocoa is probably more frequently used for that purpose.

When Cortez and the Spaniards entered the vast empire of Montezuma they found that the use of chocolate was common. When Cortez sent to Charles V the principal products of the New World, he included chocolate. The conquerors were not slow to appreciate its excellent qualities. For some time, however, Spain depended upon the colonies for the manufactured product; but when the art of manufacturing it was discovered, the raw material also was imported.

As early as 1550 chocolate factories of considerable size existed in the southern parts of Europe. The first factory in the United States was at Dorchester, Massachusetts, in 1765. At the present time the United States leads the world in the manufacture and consumption of chocolate and cocoa.

Manufacture. Both cocoa and chocolate are manufactured from the seeds of the cocoa bean. The term *cocoa* is a corruption of the word *cacao*. The large pulpy pods contain up to 40 seeds, imbedded in a mucilaginous substance. When matured the pods are split open and the seeds removed, fermented, dried, and cleaned. In the fresh stage, the seeds are very bitter, and, like coffee, the beans must be roasted. The finished product depends upon the roasting process. After roasting, the beans are cracked, the germ is removed, and the shells are separated from the bean fragments by means of fans. The portions of the beans are sorted for size by screening. These kernels or cracked beans, freed from shells, are known as cocoa nibs. In this form, chocolate and cocoa are imported into this country. The nibs from different species vary in fat or cocoa-butter content, color, acidity, and bitterness, and, like coffee, are blended for certain results. They are then ground at a temperature sufficiently high to melt the mixture to a thick oily paste, known as *chocolate liquor*, which is the foundation of the various chocolate products.

Bitter or **plain chocolate** is made by running the paste into molds and cooling it. Bitter chocolate contains close to 50 per cent fat and may run higher.

Sweet chocolate contains some kind of sugar, and may have cocoa butter and flavoring added to the plain chocolate. These are all mixed well and rolled into cakes of various sizes.

Milk chocolate is made from either bitter or sweet chocolate by the addition of milk, whole or skim, evaporated, condensed, or dried—with or without cocoa butter or milk fat and flavoring.

Cocoa is made from chocolate by putting the thick, oily chocolate paste into a hydraulic press and removing a part of the cocoa butter. The cake then is pulverized, and there results a rather dry powder, known as cocoa. This may be as low as 8 per cent fat, although its average is nearer 30 per cent. The fat content must be stated on the label.

Breakfast cocoa is a high-fat cocoa. It must contain at least 22 per cent fat. It may be spiced or flavored.

Dutch process cocoa differs from that prepared by the regular or natural process in that it has been treated with an alkaline solution, such as potassium, ammonium, or sodium. This makes the Dutch cocoas darker in color, less acid, and less bitter than natural cocoas.

All these chocolate products must have their composition stated definitely on the label of the package.

Composition and Nutritive Value. The composition of chocolate and cocoa is more important than that of tea or coffee, since they are added directly to the liquid and become a part of the beverage, contributing appreciably to its energy value.

The stimulating quality of these beverages is contributed by the alkaloid *theobromine*, which is similar to caffeine in composition. A smaller amount is present than in either tea or coffee, so that the beverage is less stimulating. There is also less tannin present, but there is sufficient to contribute to both flavor and color. Roasting changes some of the tannin to an insoluble form. This is partly responsible for the reddish color, which is considered desirable. The carbohydrate is mainly starch, but during the roasting some of this is changed to dextrins and sugars.

Table LXV · *Proximate Composition of Chocolate and Cocoa*

	Water	Protein	Fat	Carbohydrates	Minerals
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Chocolate	5.9	12.9	48.7	30.3	2.2
Cocoa	4.6	21.6	28.6	37.7	7.2

Table LXV gives the average proximate composition of chocolate and cocoa.

As can readily be seen by a study of the composition of cocoa and chocolate and the methods of preparing them, they are more than beverages; they are foods rich in nutrients which furnish energy in the form of starch, protein, and fat, and also supply building material from the protein and ash constituents. Usually milk and sugar are added to the cocoa or chocolate and thus further increase the nutritive value in proportion to the amounts of these added.

Selection and Buying. There are many brands of chocolate and cocoa on the market, varying in color, flavor, and cost. As with tea and coffee, flavor and color depend upon personal taste, and price is not a guide to selection. It is well to experiment, find the brand preferred, and then stick to it.

Chocolate is available in cakes and packages of one-fourth pound to two pounds each. Half-pound and pound cakes are most common. There are large cakes for the wholesale trade. For the retail trade, regardless of the size of cake or package, chocolate is marked off or cut into squares of one ounce each, for easy measuring. Chocolate may be obtained as bitter or regular, sweet, and milk. Sweet and milk chocolate are available in both cakes and chips or bits. The bits are usually put up in packages or cellophane bags of one-fourth, one-half, or one pound.

Cocoa, either regular or Dutch process, is available in tin or in cardboard cartons, varying from one-fourth to one pound and even larger. One pound is the most common size. The Dutch-process cocoa is less acid, less bitter, and darker in color than the natural. The cocoas are of high, medium, and low fat content, and vary accordingly in richness.

Care and Storage. Because of the fat content, chocolate and cocoa should be stored in airtight containers, in a cool dark place. In warm weather, chocolate may be kept in the refrigerator, if desired. If allowed to get warm the cocoa butter begins to melt and come to the surface, where it hardens if the temperature is lowered, forming unattractive white patches.

Use in Cookery. Chocolate and cocoa are fairly modern products. Today, in addition to their use in beverages, chocolate and cocoa are used to flavor many kinds of desserts the world over, including cakes, pies, puddings, soufflés, and sauces. They are used extensively in ice cream and candies. The United States uses chocolate and cocoa in cookery in greater quantities than any other country.

Chocolate sticks and burns readily. To prevent this it should be melted over hot water or very low heat, or in a small amount of milk or water. It should be heated to the boiling temperature in order to cook the starch. There is enough fat present in chocolate to separate the starch grains so that it can be added directly to hot liquids without lumping. When liquid is added, it should be hot, since a low temperature hardens the fat in the chocolate with the result that the chocolate blends with the liquid less easily.

Cocoa, on the other hand, blends readily with cold liquid, since the fat content is low. It behaves like dry starch and will lump if combined directly with hot liquid. The starch grains should be separated with sugar or with a small amount of cold liquid before combining. Like chocolate, cocoa should be boiled to cook the starch. Thorough cooking improves both flavor and digestibility, and gives a beverage made with these products more body. Cooking holds the starch in suspension, preventing separation of the cocoa or chocolate.

Both chocolate and cocoa (except Dutch-process cocoa) contain tartaric and acetic acid. Because of the presence of these acids soda may be used with them for leavening. The acid content is low, however; rarely is there enough present to curdle milk.

Cocoa and chocolate may be substituted one for the other, but the difference in fat content should be considered for the best results. Except for the difference in fat, 3 tablespoons on the average of cocoa is equivalent to 1 square (one ounce) of chocolate.

Beverage Chocolate or Cocoa. In preparing a beverage of chocolate or cocoa, the aim is to have a smooth, well-blended product, with the starch thoroughly cooked and the chocolate flavor enhanced by the addition of sugar and a trace of salt. Both the flavor and nutritive value are improved by the use of milk for most of the liquid.

To 1 measuring cup of hot milk, basic proportions for hot chocolate or cocoa are these: 1 tablespoon cocoa (or $\frac{1}{3}$ to $\frac{1}{2}$ square chocolate), $\frac{3}{4}$ to 1 tablespoon sugar, a few grains salt, and 2 tablespoons water. Combine the cocoa or chocolate, sugar, salt, and water in a small saucepan and heat it slowly to the boiling point, stirring constantly. Add this paste to the hot milk in a double boiler. Cover and heat to serving temperature. If desired the hot beverage may be flavored with vanilla, and each cup garnished with whipped cream. Skim milk, whole milk, evaporated milk, or dry-milk powder (made up with water) may be used.

Chilled or iced chocolate or cocoa may be made in the same way and chilled before serving. This drink is sometimes called "chocolate milk."

One thing to guard against in the preparation of these beverages is the formation of a scum on the milk as it heats. (See page 123.) This can be prevented by avoiding any unnecessary heating of the milk, by keeping the milk covered during heating, and by agitation or beating. It is a good practice to beat hot chocolate or cocoa just before serving.

For making either a hot beverage or cold chocolate milk, it is a big time-saver to keep a chocolate sirup in the refrigerator. The following proportions make such a sirup.

Chocolate Sirup

1 cup cocoa (or 5 to 6 squares chocolate)
1 cup sugar
$\frac{1}{4}$ teaspoon salt
1 cup hot water
1 tablespoon vanilla, if desired

Combine the cocoa, sugar, and salt in a saucepan. Add the water and bring to a hard boil, stirring constantly. Boil gently for about five. minutes, stirring to prevent sticking; or put the mixture into a double boiler and cook for about 15 minutes. Cool, add vanilla, and put into a glass jar for storing. Add this sirup as desired, to cold or hot milk, heated in the double boiler, and beat with a rotary beater.

The use of chocolate and cocoa in various kinds of desserts is considered in appropriate chapters.

CASSINA AND MATÉ

The leaves of the cassina, the North American species of Ilex, may be cured and used to make a beverage similar to tea and coffee. Cassina, like tea and coffee, was discovered and used for centuries before scientific research showed that the active principle of the plant is caffeine. The leaves of this plant were cured in a crude way and used by the North American Indians. The South American Indians used another species, called maté, for the same purpose.

During the Civil War, when tea and coffee were not available to the people of the South, crudely cured cassina leaves were used extensively for preparing a stimulating beverage. The plant grows naturally and abundantly on poor sandy soil, over an area of about 40,000 square miles, extending from the James River in Virginia all along the coast of the Southern and Gulf states to the Rio Grande. In 1921, the Bureau of Chemistry of the United States Department of Agriculture carried on laboratory experiments in the scientific curing of cassina leaves. This work showed that a beverage-producing product could be made for use in the same manner as tea and coffee. A flavoring sirup, for use in carbonated beverages, also was produced.

The South American maté, also called Paraguay tea, has been commercialized extensively in many of the South American countries, especially in Paraguay, Uruguay, Argentina, and Brazil. This tea is made from dried and roasted leaves and shoots of the shrub or tree. The leaves contain caffeine, tannin, and more flavoring oil than either tea or coffee.

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XXVI · Condiments and Their Use

Condiments are a group of substances used in small amounts to bring out or add to the flavor of foods. Some flavorful foods already discussed have condimental value. Sugars give sweetness, which has a universal flavor appeal. Some of the sirups have special flavors along with their sweetness, which make them doubly valuable. Sweetness, alone, grows tiresome; so condimental flavorings are added to candies, cakes, and sweet desserts to supplement and give character to their sweetness. Vanilla is frequently used for this purpose. In addition to their use in beverages, tea, coffee, chocolate, and cocoa are used to flavor sweets and desserts. Chocolate and cocoa are especially popular for this purpose.

Fresh fruits also are used for flavor. Lemon and orange juice and the aromatic oils in the grated citrus peels are often so used. Other fruits added in the form of juice, purée, or small pieces contribute their desirable flavors to many dishes.

Leeks, Shallots, Chives, and Scallions · They add delicate flavor and a touch of green color to soups, salads, and other mixed dishes

U.S.D.A.

Wide use is made of the aromatic fresh vegetables in seasoning. The onion family, the peppers, green and red, the herbs, may add both flavor and texture. Nuts too add their special flavors and textures to some dishes. The use of many of these has been discussed in previous chapters.

The purpose of this chapter is to point out the importance of flavor in food, and to give, in addition to the flavor foods already discussed, a list of the important condiments and some very general rules as to their use.

IMPORTANCE OF FLAVOR

Flavor is important to good nutrition. It stimulates appetite, promotes good digestion, and adds to the enjoyment of meals. A well-balanced meal does nothing to improve nutrition unless eaten, and eaten in the amounts required to supply needed nutrients. A well-known British biochemist designated condimental substances the "catalysts of nutrition." While they may contribute little directly to the nutritive value of the diet, they make a real contribution to good nutrition through their influence on appetite and the amount of food consumed.

Many foods have their own characteristic flavors that may need only to be brought out. Salt does just this; so to all prepared dishes one adds salt—not much; just enough to bring out the natural flavor of the food. Salt is best added during preparation—enough, but not too much. More can be added at the table if needed, but too much cannot be removed.

Some food flavors need to be pepped up; so along with the salt goes the pepper that gives just the needed lift. Onion juice or one of the herbs may be added, just a bit to give more character to something on the insipid side, not enough to steal the show, but enough to strengthen the leading character in the dish. The herbs basil and rosemary and a suggestion of garlic added to a dish of squash do just this.

Some foods more or less neutral in taste are used as a background for highly flavored dishes. Rice and present-day white breads are said to be good carriers of flavor. We serve with them foods with high flavor value, fats, relishes, or a sweet spread. Most dishes, however, should be flavored so as to be complete in themselves.

Sensory Factors in Flavor. One tends to think of flavor just as taste. While taste is important in flavor it is only one of the physical senses involved. Flavor is a complex sensation to which odor and feel (texture, consistency, and temperature) contribute as well as taste.

Food loses a surprising amount of flavor when one has a cold that blocks off the sense of smell. The feel of food to the lips, the tongue, the throat, and its temperature contribute to flavor. For most people, tenderness and crispness are desirable texture attributes; butteryness, greasiness, pastiness, and toughness are undesirable.

While the temperature at which foods are served influences the keenness of taste and odor sensation, the preference for some foods at specific temperatures seems evidence that temperature in itself is sometimes a factor in flavor.

Psychological Factors. The desirability or lack of desirability of a particular flavor to an individual is influenced by psychological factors. In general one likes familiar or accustomed flavors. This is the basis for the development of family likes and dislikes in flavors. Regional and racial food habits cover not only kinds of foods eaten but also seasonings and methods of cooking that influence both taste and texture. Pleasant and unpleasant associations with flavors are influential in determining likes and dislikes. New flavors and new textures in foods should be introduced slowly in either family or group feeding. Both are more likely to be accepted if introduced under pleasant circumstances.

KINDS OF CONDIMENTS

Sugar, salt, acid, and bitter are the primary tastes entering into flavor. Relatively pure sources of these are used to test keenness of taste. To these basic flavors and combinations of these, many variations are added by the volatile oils, and soluble extractives found in both animal and vegetable products. Those used in separated form and added in small amounts to strengthen or modify flavor of made dishes are called condiments.

Salt, vinegar, and pepper are the most used condiments. They are likely to be present in every home. In addition, spices of various kinds, flavoring extracts, herbs, plant roots, and fungi have condimental value.

Salt. Salt, sodium chloride, is universally used. Possibly the liking for salt is a protective measure. Salt supplies the chlorine for the hydrochloric acid in the gastric juice needed for digestion in the stomach. The amount of salt present in the body helps to regulate the water content of the body tissues and fluids. Under normal conditions, well-seasoned food carries enough salt to meet the needs of the body. In hot weather, when perspiration is excessive and the loss of salt from the body is increased, it is sometimes desirable to increase the use of salt in food or to use special salt tablets.

Salt is obtained from salt beds or by the concentration of salt water pumped from underground lakes or from surface salt waters. Commercial salt is a purified product, almost pure sodium chloride, except as certain other substances are added to prevent caking. Salt is hygroscopic. In damp air it absorbs water and cakes. Table salt frequently has small amounts of alkaline salts, sodium and magnesium carbonate, added to make it free-running.

Because of the universal use of salt, it has been selected as a vehicle for carrying another closely related element, iodine. Iodine in small amounts is essential to proper functioning of the thyroid gland. Some soils are lacking in iodine, and persons living in such areas are subject to goiter. The use of iodized salts which are readily available on the market prevent this. An article in the *Journal of the American Medical Association* pointed out again the importance of the use of iodized salt in the prevention of that form of goiter which results from a deficiency of iodine in the food supply.[1]

Special salts are prepared to carry aromatic vegetable flavors. Onion salt, garlic salt, and celery salt provide convenient means of adding these flavors with a minimum of effort. A group of mixed herbs contribute their aromatic flavors to an omelette salt to simplify the preparation of "omelette aux fines herbes."

Acids. While lemon juice is much used, vinegar is the staple form in which acid is most used in the home. Vinegar is formed by the fermentation of fruit juices to the acid stage. In this country it is largely made from the juice pressed from apples, cider. It can be prepared from any other sugar-containing fruit juice or by fermentation of wine by the acetic-acid forming bacteria that change

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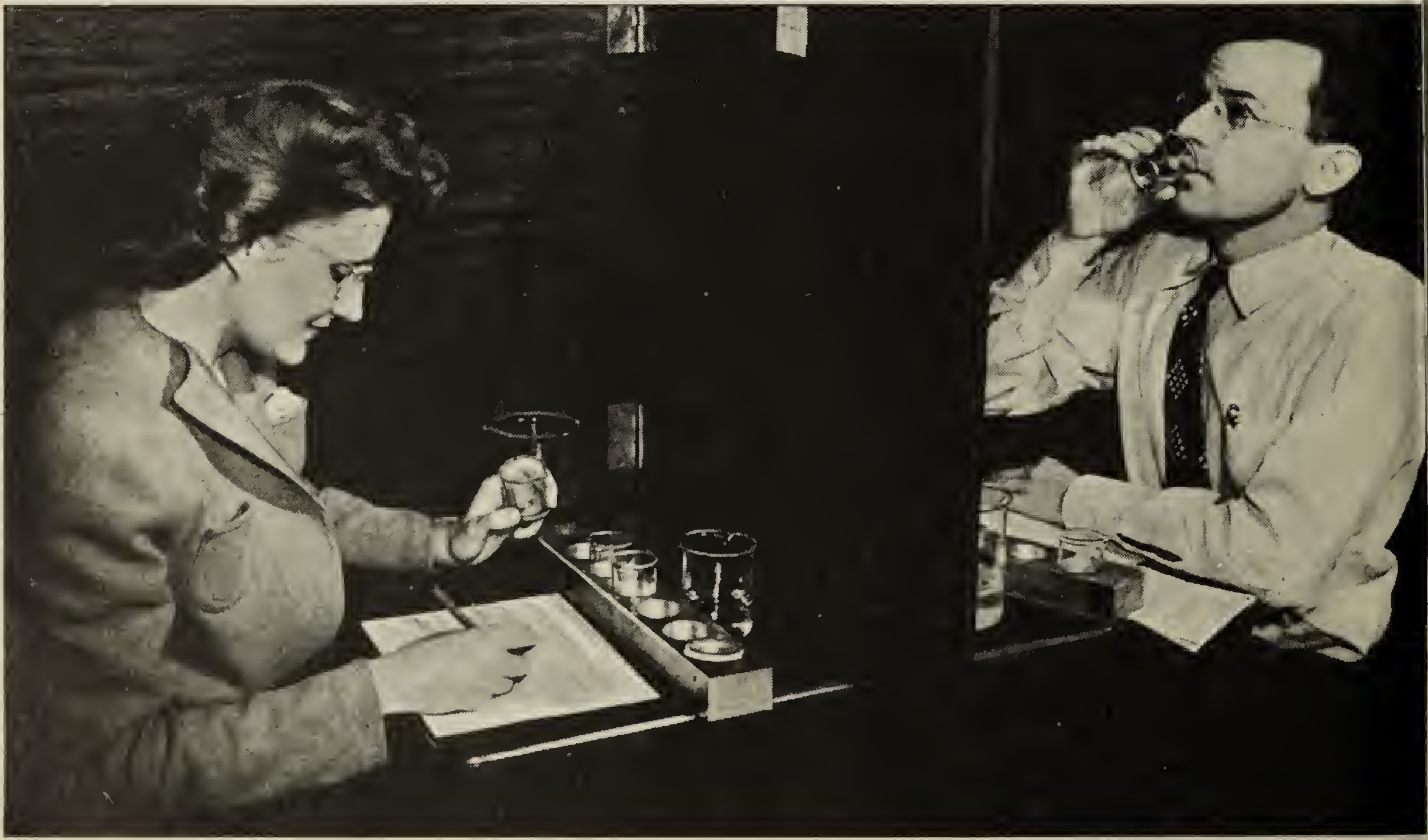
[1] O. P. Kimball, *Journal of the American Medical Association*, No. 130, pp. 80–81, 1946.

Testing Laboratory Workers to Determine Their Keenness of Taste · Necessary before they are allowed to serve on a panel to judge the flavor factor in palatability of foods



alcohol to acetic acid. The acid in vinegar is largely acetic but small amounts of other fruit acids may be present.

Vinegars on the retail market are 4, 4½, or 5 per cent acid strength. Four per cent is the required minimum strength. These figures represent the number of grams of acetic acid contained in 100 cubic centimeters of vinegar. For pickling, a vinegar of at least 4½ per cent acetic acid is necessary. In the trade, this is sometimes spoken of as "45 grain" vinegar.

Tarragon vinegar used in salad dressing and acid sauces, such as tartar sauce, is vinegar flavored with tarragon, an evergreen aromatic herb. Onion and garlic vinegars for use in salad dressing are prepared by soaking these bulbs, thinly sliced, in vinegar until the desired flavor has been obtained.

Peppers. While pepper is listed as spice, its wide use and variety of forms make special consideration desirable. Both white and black peppers are the powdered dried fruits of Piper nigrum, a perennial vine, native to India, the Malay Peninsula, and near-by islands. The fruits are called peppercorns.

Black pepper is made from the immature peppercorn. Either the mature or immature peppercorns from which the coatings have been removed are used in making white pepper. Black pepper is more pungent than white. The most pungent pepper flavor is obtained by grinding the pepper as used. Small pepper mills are available for use in grinding the peppercorn at the table.

Red pepper is the powdered mature fruit of a species of Capsicum, which is not a true pepper plant but a native American species unknown in Europe until after Columbus discovered America. Cayenne pepper and chili pepper are made from varieties of Capsicum but only from the small-fruited ones. The best cayenne pepper comes from Africa.

Paprika is sweet, red pepper made from a mild Capsicum. It is used for color as well as flavor. Paprika is a product of Spain and Hungary and comes to this country already ground. The large-fruited Spanish Capsicum from which paprika is made are called pimentos. Paprika is valuable not only for its condimental qualities, but when freshly ground may contain both vitamin A and vitamin C.

Tabasco is made in America from a fiery, long-fruited pepper. It is sold as a sauce rather than as a powder.

Chili is a designation used to cover many varieties of peppers used to flavor foods in Mexico and other Latin-American countries. Some are relatively mild while others are like white fire. Chile generally refers to the Chili Colorado or red chili used as a flavoring in rich sauces. This is only mildly hot. Chili Jalapeno (either cooked or pickled) is served with meat. Two varieties, Serrano and Piquin, are described as delicious, but very hot. These are only a few of the many kinds produced. The different varieties represent a wide range in flavor. In some form, as a sauce, a pickle, cooked with the food, or served raw as a relish, they are used extensively to add flavor to menus in Mexico and other countries to the south of us.

Spices. Various parts of tropical plants, shrubs, and trees are used as spice to add flavor to our foods.

Cinnamon and cassia are inner barks; cloves and capers are flower buds; mustard, anise, caraway, coriander, cardamon, and nutmeg are seeds; mace is the covering of the nutmeg; allspice is a fruit; horseradish, ginger, and tumeric are dried root stocks; and the leaf of the bay tree, either fresh or dried, is used. Curry is a mixture of ground spices with pepper, in which tumeric is the principal ingredient.

Spices are dried. Many of them are ground and pulverized, although some are available unground. Cinnamon may be purchased as bark; allspice, cloves, and nutmegs as dried fruit, flower, and seed. With the

Office of Foreign Agricultural Relations, U.S.D.A.

Vanilla Beans Grow in Clusters on a Tropical Vine Belonging to the Orchid Family

A Bundle of Sixty Vanilla Beans Cured and Ready for the Market

U.S.D.A. Exp. Sta. Mayaguez, Puerto Rico

exception of the nutmeg, which must be grated, these are used directly. Spices in whole form lose flavor less rapidly than when ground. Cinnamon and cloves are available as aromatic oils. In this form, they are very strong and must be used with care, but the oils are useful to flavor food mixtures without influencing color. Spices should be kept in a tightly closed container, since much of their aroma and flavor are lost on exposure to air.

Flavoring Extracts. Flavoring extracts are solutions of aromatic oils in alcohol. True extracts are made from the volatile and soluble flavoring substances obtained from plant sources. Many characteristic natural flavors now are closely duplicated by synthetic chemical compounds. These are used to prepare artificial or imitation flavors, which must be so labeled.

Flavors are obtained from plant materials by various means. Some can be extracted directly, as the oils in the citrus peel and the almond. The delicate flavor of rose leaves is absorbed on sugar crushed with the petals and then dissolved to yield a rose-flavored sirup.

Some flavor substances, like peppermint, are volatile and are recovered by distillation after the leaves have been macerated to release the essential flavor substance.

Vanilla is obtained from beans that grow on a tropical vine closely related to the orchid. Its distinctive fragrance and flavor are developed by curing the beans after gathering.

Formerly the bean itself was sold as a source of flavor; small portions were added directly to mixtures to be flavored. Another

These and Other Garden Herbs Can Add Flavor and Interest to Many Everyday Dishes · (*Upper left*) Rosemary leaves, fresh or dried, are used in cream soups, combined with parsley in butter over poultry, and sparingly in meat stews and sauces. (*Upper right*) Sweet basil adds distinctive flavor to salads, cooked cucumber, squash, and dishes containing eggs. It combines well with other flavors. (*Right*) Sweet marjoram is used dried in seasoning for poultry or veal, fresh or dried in herb butters for use with cold meats, and in potato salad and cooked vegetables. (*Lower left*) Tarragon is used in green salads, adds flavor to tartar and other acid sauces used with fish, and in mild-flavored cream soups. (*Lower right*) Thyme is blended with other herbs into mixtures for use in stuffings, gravies, meat stews, soups, and egg and cheese dishes

practice was to place the bean with a special supply of sugar in a tightly closed container. The sugar absorbed the delicate flavor from the bean and carried it into cakes and desserts. Now the beans are extracted in alcohol, and vanilla extract has come to be the most popular of the flavorings. Flavoring extracts are sold in bottles, which should be kept closed to avoid loss of flavor. They should be used only in small amounts.

Herbs. In addition to the vegetables already considered as useful in seasoning there are the savory herbs. These are grown specially for condimental purposes and are used in small amounts green or dried. As a garnish or as finely minced green leaves, parsley, rosemary, sweet basil, mint, sweet marjoram, tarragon, chervil, summer savory, and dill all have special uses. They may be added to the dish to be seasoned directly or used in the form of herb butters.

These green leaves are good sources of vitamins A and C when used fresh as a garnish and should be eaten and not pushed to one side. A small collection of herbs in a window box is useful to add flavor and interest to many winter dishes. All the herbs listed above and sage and winter savory are dried for winter use. When the dried herbs are used, chopped parsley, always available in fresh form, should be added to give color and texture.

Plant Roots. Two roots used in fresh form —ginger and horseradish—might well be considered (with the herbs). Fresh ginger root is a favorite seasoning with the Chinese. Horseradish, of European origin, is extensively grown and used in this country for its hot, biting taste.

Fungi. Two fungus plants are important in seasoning—mushrooms and truffles. Mushrooms are generally available fresh, canned, and occasionally dried. While used alone as a vegetable, or combined with meat in creamed dishes, they are also much used as a seasoning since they furnish extractives of pleasing flavor.

Truffles are black fungus plants that grow completely covered in the soil. They are about the size of plums and have an aromatic and pungent flavor. They are not readily available in this country, but in France they grow wild and are used for seasoning and garnishing meat dishes.

Flower Buds. Capers are flower buds that grow on a small shrub found in the Mediterranean area. These are distributed in pickled form. They are used in sauces for meat and fish.

USE OF CONDIMENTS

Seasoning is an art. No definite rules can be laid down. Tastes differ; condiments vary in strength. All should be used with a light hand and blended to get different flavors. Chinese cooks are past masters at this. With only a trace of garlic, soy sauce, ginger, and vegetable juices they get a flavor rarely achieved in North American cookery. The French also have a flair for seasoning. They use herbs to advantage, as do all the Europeans. These are among the simplest of the condiments and may be had for the growing, and so offer a good place to begin.

In using herbs, including mushrooms and ginger root, for seasoning, chop them fine to release the juice and blend them with fat. This helps to draw out the flavor. Herb flavors are volatile; so herbs should be added at the last of the cooking process. For combinations most satisfactory with different foods, see *Savory Herbs* listed in the references.

Spices should be added in small amounts and in intriguing combination. Whole spice in bags adds its flavor to liquids, and the bags can be removed when the flavor is just right. Dry spice may be combined with the dry ingredients in a mixture, or added separately.

Flavoring extracts may be used singly or together, never in large amounts. Add after cooking, except in baked foods.

In this country, cooking has never been a fine art. We have an abundance of foods of high quality; too often they are served overcooked and poorly seasoned. Condiments are added at the table. The old-fashioned revolving castor carrying an assortment of seasoning used to be provided on the table for this purpose. Now a few standard seasonings are supplemented by a variety of bottled sauces. It is an insult to a well-cooked steak to smother its flavor in catsup or one of the numerous "steak sauces."

Seasoning is an art to be practiced in the kitchen. Most of the condiments discussed in this chapter are at their best if added to the food while it is being prepared. No definite rules can be given as to amounts or combinations. Begin with a little, using measured amounts, and taste until just the right flavor has been obtained by delicately adding more seasoning. Too much food leaves the kitchen untasted.

We are not able to give all the answers. We hope we have stimulated an interest and pointed the way, so that you can do your part in the better feeding of our country through better selection and preparation of food, and that in this latter condiments may do their part.

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XXVII · Meal-Planning and Service

Meal-planning is an important responsibility of the person who is responsible for the food for a family. Before any meal is served, it must be planned, even if only in someone's mind. The food supplies must be obtained if not already on hand; and each dish which makes up the meal must be prepared and cooked, each started at the right time so that all can be served together or in the proper sequence.

The place of the different foods in the diet, guides to selection and buying, and methods of preparation are discussed in the various chapters of this book. The planning and serving of meals are left to this final chapter.

MEAL-PLANNING

The scientific planning of diets for special conditions may be a complicated and exacting job, especially when a detailed accounting must be made of the required nutrients, the amounts of protein, carbohydrate, and fat, and the total calories supplied. While family meals must provide adequate amounts of the required nutrients, the same attention to detail is not necessary. Also practical nutritionists have worked out simple methods by which adequate food supplies for individuals and families can be planned and checked on the basis of food groups, without time-consuming calculation of the exact nutrient content.

The National Food Guide gives a simple listing of the number and size of servings from seven basic food groups that will supply the essential nutrients. This list (see page 19) can be used to check the foods provided the family each day, to see that the "must" foods are included. This use of the food guide helps to build diet patterns that simplify future planning. When the supplies provide adequate amounts from the "must" food groups, the diet for the day is said to be balanced. Meals are well planned when each makes its appropriate contribution to the balance for the day in terms of the food groups.

But meals planned well from the point of view of nutrition must also be satisfying. The most nutritious meal is of no use at all unless it is eaten. A meal, therefore, must have appetite appeal. This brings in not only the science of food preparation but also the arts of cooking and serving food. Furthermore, most families must consider the cost of food, and economy of time and energy in preparing and serving meals.

Practically, with a basic knowledge of nutrition, food-buying, and food preparation, plus the help of a few simple rules and meal patterns, meals which are satisfactory from all the various standpoints may be planned easily and quickly. Practice in the everyday preparation and serving of meals will add to the proficiency of the person whose job it is to plan the meals. No other job of the homemaker is more important, since the health and well-being of the family depend to a large extent upon the meals which she serves

Advance Planning. Planning a day's meals in advance is much better than planning one meal at a time, and in most cases it is advisable to plan for several days. Planning facilitates the checking in advance of the nutritional adequacy of the supply for the day or the week, in terms of the recommended amount of each food group. Time is saved in marketing by the preparation of a weekly shopping list for staples, and reminders of fresh supplies to be purchased from day to day. Meals planned ahead make possible the preparation of some foods in advance with a saving of time and fuel. Most important of all, well-made plans tend to give poise and peace of mind to the homemaker and make it possible for other members of the family to participate in special jobs without interfering with a smoothly running schedule, since the person doing the planning has more poise and peace of mind, and everything runs more smoothly than is possible when the work is done on a meal-by-meal basis.

The unit of time on which the planner works will vary with the particular situation, but it never should be less than a day. On a meal-at-a-time basis, the advantages just listed cannot be realized. Market conditions, transportation, home storage space, variation in the size of the family, numbers of guests, and other factors affect the length of time which is best for good planning. Each homemaker or meal-planner should work out the system which is best for her particular situation.

WEEKLY MARKET ORDERS. Meal-planning and marketing must go hand in hand. Many homemakers do the bulk of their marketing once a week, buying only the perishable foods more frequently. These market orders are based on tentative meal plans. As a guide to planning the market orders that will provide adequate diets, the amounts of each of eleven market groups of food required to provide the necessary nutrients, including calories, for one week has been calculated for persons of different sex, age, and degree of activity. These are given in Table V, page 23.

From this table the amount of each food group required by each member of the family group is obtained. The weekly market order for the family will be the sum of the requirements of the individual members. Between groupings there may be a shift with the amount of money there is to be spent for food. The recommendations are made for families with low incomes and for those with moderate incomes. Within these food groupings there is ample opportunity for choice on the basis of market supply, price, and family preferences. Table VII, pp. 26, 27, shows the amount of each group required for a family of two adults and the amounts required for a family of two adults and two young children. Suggested market orders based on these requirements are given.

While such detailed calculations may not be necessary after a buying pattern is well established, it should be followed in the beginning and occasionally later as a check. The right food is too important to health to be left to chance, and most families must keep within a food budget. The smaller that budget, the more careful the planning must be if meals are to be adequate, palatable, and interesting. It is a much easier job when food money or supplies are abundant.

The first step, then, is to know how much can be spent for food. The lower the income the larger the share that must go for food. And many families with low incomes are large families, so that the small amount must be spread further. It is good to try one's skill in planning good nutritious meals on a limited budget, as well as on a large one.

Next the home-maker should calculate the food needs of her family in terms of the amount of each market group required for a week.[1] Putting these supplies into three meals a day also requires planning if the family is to obtain the most in satisfaction as well as nutrition. The staple supplies are checked first, and needed supplies go on the weekly order. This means a special trip to the market at the most convenient time. Many fruits and vegetables can be purchased in larger quantity than the supply for a day. The amount of perishables that can be purchased at one time will be limited by storage facilities, but planning ahead will cut down the number of market trips. It is wise to spend time over the grocery advertisements before roughing in the menus as a basis for the weekly order. This makes it possible to take advantage of bargain sales. Always leave advance menus flexible. Market inspection may suggest a change, there may be unanticipated leftovers to be used, or unexpected company may appear.

Meal plans, like time schedules, are to guide not to bind the homemaker. They contribute to smooth management and make it possible for other members of the family to help out or even to take over with a minimum of interruption.

Appetite Appeal. To have all the food groups represented in the right amounts does not mean a satisfactory diet or a successful meal. Meals that are "good for one" should be good to eat. There is pleasure associated with the eating of foods which appeal to the eye and to the senses of taste and smell. Some foods are colorful, others colorless; some flavorful, others bland; some crisp in texture, others mealy or creamy. For interest or appetite appeal there should be variety from week to week, day to day, meal to meal, and within the meal. There should be plenty of color, either contrasting colors or harmonizing colors, to give eye appeal; and aroma and flavor for taste appeal.

VARIETY. When one looks at the food supplies to be found in the average market, fresh, frozen, canned, and dried, to obtain variety in meals is seemingly an easy thing to do. Yet many persons limit their choice to the same few foods, too frequently cooked in the same way day after day. Sometimes they do so because the family likes special foods and ways of preparation. If these will provide the necessary nutrients no real harm comes from a narrowed choice, but the members of the family should be encouraged to widen their acquaintance with other desirable foods and methods of preparation. Sometimes the lack of variety in foods and ways of preparation is caused by lack of interest and imagination on the part of the person responsible for planning and preparation, and a failure to see the importance of the job.

A certain food item or flavor should not be repeated too often and never in the same meal. If tomato soup or tomato juice makes the first course, then select another vegetable for the salad. Likewise, similar flavors, such as those of cauliflower, cabbage, and brussels sprouts, should not occur in the same meal. There also should be variety in texture in each meal. Serve a crisp vegetable with a soft one and use only one creamed dish at a time. For interest it is best to vary the method of cooking a meal. This does not mean that one cannot have an attractive meal if the meat and all the vegetables are cooked together, as in a stew or in the so-called "boiled dinner." This type of meal is economical of fuel; and variety in color, flavor, and texture may be obtained by the choice of vegetables.

COLOR. A well-balanced meal, perfectly prepared, may be lacking in appetite appeal because of a lack of color. People eat with their eyes. A plate of roast pork, mashed potatoes, milk gravy, and cauliflower is uninteresting to look at, no matter how well it may taste. If the mashed potato is changed to a baked one and a bright green or yellow vegetable replaces the cauliflower, the plate takes on eye appeal.

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[1] See pages 23 to 27.

Some colors just don't go well together, on a plate any more than in a costume. Beets and tomatoes are a good example.

Flavor. A plate of food may be attractive to look at, yet lacking in flavor. This may be due to a poor selection, that is, all the foods may be bland in flavor; or it may be caused by methods of cooking which destroy or cause a loss of the natural flavors; or, it may be due merely to lack of proper seasoning.

Satiety Value. Each meal not only should satisfy the appetite at the time it is eaten, but also should stay hunger between meals. Well-balanced meals will include foods which have that stick-to-the-ribs quality. Foods which take longer to digest than others, because of their fat and protein content, have this advantage.

Meal Patterns. Meal patterns vary with areas and with families within areas. Meals are adjusted in time and content to work, school, and living arrangements, and to the food requirements of the family. In the United States the general pattern conforms to three meals a day.

Breakfast. As the name indicates, breakfast ends the longest period of the day without food. It should supply a ready source of energy to carry through the morning hours, as well as provide its share of "must" foods. The time for breakfast is determined usually by the work schedule of the family wage-earner.

Fresh fruit in season or fruit juice, cereal, and toast with butter and jelly, jam, or marmalade, and a hot beverage for adults and milk for children form a standard breakfast pattern, of which there are many variations, subtractions, and additions. Such a breakfast can well be planned to carry its full share of the day's nutrients, without early rising on the part of the homemaker. Except for hot cereal and beverage, the food can be assembled the night before, and all can be readied for service in short order. With appropriate equipment toast can be prepared at the table. Extra slices of toast will do duty for both toast and cereal, or a double serving of cereal make toast unnecessary. When both are whole-grained or enriched, they may be used interchangeably, and provide the cereal nutrients in the form or forms preferred. To such a simple breakfast there are many possible additions when time permits, the next meal does not come too soon, and the work program to follow will not be disturbed by heavy digestive demands.

For the farmer and industrial worker, breakfast comes early and must provide energy for hard physical labor before the next meal. For the white-collar worker, the breakfast hour is later and the energy demands are less. Active children and adolescents require extra energy and food to grow on. A too light breakfast for either child or adult may result in a mid-morning slump and encourages piecing before the next meal. Piecing between meals dulls the appetite for a real meal when it comes.

In general the breakfast should contain from one fifth to one fourth of the calories for the day. It is hard to make a fixed rule. A good rule is to provide enough food so that no one needs to piece before the next meal. The energy needs of the different family members will vary. The size of servings and additional foods can make good this difference.

The time schedules of the different family members may vary also. There may be a tendency on the part of some members of the family to sacrifice an adequate breakfast for a longer morning sleep. This can best be prevented by providing a simple but appetizing breakfast in an easy-to-eat as well as easy-to-prepare form.

Except on Sundays and holidays there is little time for elaborate breakfast preparation or services in the modern household, and if any immediate energy demands are met, the other meals can be planned to provide the foods lacking in the breakfast meal. But even a simple and easily prepared breakfast may include bacon or eggs in some form, or both. These may replace the cereal or be in addition to it. Hot breads, biscuit, muffins, or pancakes take little time if made up ready for cooking the night before. With bacon or ham and eggs, or sausage and sirup, energy may be packed into the breakfast meals for those who need it. With a little planning and experience such a breakfast takes little time and may do much to stimulate lagging breakfast appetites and to get the family up on time when that is necessary.

DINNER AND LUNCH OR SUPPER. The other two meals also vary as to time and size with the occupation and hours of employment of the wage-earner, any special requirements of young children in the family, and the schedules of the children in school. In rural areas the heavy meal of the day is at noon. The farmer eats at home and has an afternoon of hard physical work ahead of him. Into this meal as much as one half of the food for the day may go. Supper is a light meal when a hot school lunch is available to the children. Otherwise supper differs little from dinner.

Urban workers tend to lunch at the place of employment or near by. The older children lunch at school, so that the midday meal or luncheon tends to be light and the heavy meal or dinner comes at night, when the family assembles and there is a time to enjoy both food and each other.

LUNCHEON. What is needed for lunch depends upon what was served for breakfast and what is to be served for dinner. It also depends upon whether this meal is served at home or is carried to school or work.

It is good management in buying and in preparation, too, to have planned leftovers from dinner to use for lunch next day.

Luncheon may be extremely simple, yet adequate in amount and in food nutrients. Like most meals the menu is built around the main dish. This is a good time to use substitutes for meat. Egg and cheese dishes and dried legumes make good main dishes for lunch. The meat or other protein food and vegetables may be combined in a heavy salad or a one-dish meal, such as a hearty soup, or a stew, meat pie, or casserole dish; or the meat, egg, cheese, or peanut butter may be combined with the bread into sandwiches, hot or cold. The vegetables may be cooked, or served uncooked as relishes or salad.

With as many factors as must be considered in planning luncheon, it is not always as easy to follow a set pattern as it is for breakfast and dinner. However, the following pattern may prove helpful to the inexperienced meal-planner in making luncheon both nourishing and interesting, yet simply and quickly prepared.

Luncheon Patterns

A main dish with a vegetable or salad
or
A hearty soup and a salad
and
Bread and butter
or
A hearty salad with a sandwich
To all may be added a simple dessert, if desired,
and always a beverage.

DINNER. With some families, it is preferred and more convenient to have dinner at night; in others, it is better to have the big meal of the day at noon. This depends upon the work and habits of the various members of the family. Either way, the planning is the same; and when dinner is served at noon, supper at night will be similar to luncheon, already discussed.

As with the other meals, the menu is built around the protein dish, which may be meat, poultry, fish, or a meat alternate dish, such as cheese soufflé or baked beans.

Potato or some starchy food is needed and at least one other vegetable. In many cases, the salad will be uncooked vegetables or fruit served on crisp salad greens.

For additional energy and food nutrients, bread in some form and butter or fortified margarine are included.

The dessert may be pie, cake, ice cream, or pudding; or it may be fruit, fresh, frozen, canned, or dried. More elaborate dinners may begin with fruit, a juice, or soup as an appetizer. Fruits and clear meat soups are especially good to precede hearty dinners. (See page 8.)

In a very simple dinner, the sweet may be supplied by marmalade, jelly, jam, preserves, or other sweet spread instead of a made dessert.

This pattern will serve as a guide in planning satisfying and nourishing dinners.

Dinner Patterns

A main dish, meat, poultry, fish, or meat alternate
A starchy and a succulent vegetable
or
Two succulent vegetables
Salad or uncooked relish (optional)
Bread and butter (optional)
Dessert
Beverage

A dinner containing as few dishes as a meat and vegetable stew, fresh relishes, and a fruit or sweet spread may be adequate in amount and in food nutrients. On the other hand, an elaborate meal of several courses may lack important food nutrients. In planning either a one-dish meal or a formal dinner, check the food groups to see if the meal is making its contribution to the day's requirements. In this way good meal-planning will soon become a matter of habit.

Special Meals. Mealtime is an important occasion for many reasons. When the right foods are correctly prepared and served, good nutrition for the family is the result. And when attractive food is served in pleasant surroundings, it gives pleasure to all. In other words, food has a social value as well as a physical one. Wise homemakers who are concerned with building the family into a strongly knit unit do not overlook mealtime as one means of accomplishing this end. Friends, too, play an important part in the social side of food service. There is nothing which gives more real joy than sharing good things with friends. Holidays, birthdays, and other special days present opportunities for something out of the ordinary in meal-planning. Special days require special meals, but holiday meals need not be difficult nor time-consuming to plan, prepare, and serve. As a matter of tradition, certain dishes are associated with certain holidays. This makes holiday menu-planning even simpler than everyday planning.

MEAL SERVICE

A well-planned and excellently prepared meal may lose some of its character if it is not well served. This does not mean that it is necessary to have elaborate service. A meal should be well served whether eaten in the kitchen, a dining alcove, a dining-room, or one end of the living-room. Neither does it mean that the homemaker should make the serving of meals complicated or consuming of time and energy. A meal can be easily and attractively served without a maid and without undue effort on the part of any member of the family.

The trend at the present time is toward simplicity in table service, as it is in other phases of managing a home. That does not mean that less attention is given to little details which make a meal attractive and enjoyable. Rather, it means that the wise planner considers the style of service which fits the needs and pleasure of her family. It means, too, that she thinks through each meal and considers the number of dishes and the amount of silver and glassware she is using, all of which must be washed and put away after the meal. It means, furthermore, that she considers the kind and amount of table linen which she uses, for that must be washed, ironed, and cared for. There are many attractive kinds of place mats available today which may give a table more colors and interest than some linens which require a great deal of time and energy to keep in good condition.

Here are some ways of serving attractively which require a minimum of time and energy. Some of the advantages and disadvantages of each method are pointed out.

Plate Service. There are some advantages in serving the plates from the stove and taking them to the table complete. The use of a tray will save trips when the family is large. The salad and other cold foods may be served in advance. This method eliminates serving dishes, such as meat platters and vegetable dishes, since with this form of service the meat is carved in the kitchen and the vegetables are served directly from the utensils in which they were cooked.

A disadvantage of this style of service is that it is difficult to supply second helpings. With a little experience the homemaker is able to adapt the servings to the needs and appetities of individual members of the family.

Table Serving. When the food is served at the table, one person carves the meat and places it on each plate, while another may serve the vegetables. Still another may, if desired, serve the salad which may come to the table in a bowl. The dessert also may be served at the table, after the used dishes and silver from the main course have been removed.

This form of serving is usually called "family style." The more usual adaptation of it is a combination of table and plate serving. The salad may be served in the kitchen and placed on the table before the family is seated. The dessert, too, if it is not a frozen dessert, or one to be served hot, may be served beforehand and placed conveniently near the dining-table, on a side table or a tray cart.

This is an excellent method of teaching family help and co-operation, with the father doing the carving, the mother serving the vegetables, one child serving something else, and perhaps another removing the dishes. On the other hand, one person may do all the serving if necessary.

With the serving of dishes of food on the table it is possible to serve fairly small portions, certain to be eaten, with second helpings for those who need or want them. For this reason family style is good when the group is made up of different ages. Such a method of serving has many advantages, the only disadvantage being that more dishes are required than in plate service.

Buffet Service. A very easy and attractive method of serving a large group with little or no help is a form of self-service, often called "buffet service." The food, however, is more often served from the dining-table than from a buffet. The meat or main dish is placed at one end of the table with a stack of plates near it. The salad may be served in a large bowl or in lettuce cups on a tray, at the opposite end. Vegetables, relishes, and rolls are attractively spaced on the table, with the necessary silver and the napkins.

The host may carve and serve the meat

while the hostess serves the salad; or the hostess may ask various guests to help with the serving, leaving her free to see that foods are replenished as needed.

Small tables may be set up for the guests, or, if the menu has been planned accordingly, tables may not be needed. In the latter case, water and glasses should be placed conveniently on a side table.

The dessert may be served in advance and placed on the buffet or tray cart. The coffee may be near the dessert, made where it is served or made in the kitchen and brought in at the proper time.

Another method of serving dessert and coffee is to do so at the dining-table, after it has been cleared of the main course. Two women guests may be seated, one at either end of the table, to serve the dessert and the coffee.

There are many variations of buffet service, but it always has the advantage of requiring little help to do well. Guests enjoy serving themselves, and they are always pleased to be asked to help with the serving. With an informal group, each guest may be asked to take his or her plate to the kitchen, or two of the men may be assigned that particular duty. It makes for informality and lots of fun for assignments to be given various guests. It is a happy method of serving the teen-agers, as well as the grownups.

Pattern for Buffet Supper

Hot Main Dish
(containing Meat, Fish, or Poultry)
A Starchy Food
(may be combined with Meat in hot dish)
Salad (Fruit or Vegetable)
Rolls or other Bread—Butter
Dessert—Beverage

Combination of Methods. Many modern homemakers use all these various forms of meal service. Family style may be excellent for dinner when all the family is together; while plate service may be best for breakfast, when the different school and work schedules may make it impractical for the entire family to eat breakfast at the same time. When this is the case, it will make for efficiency to have a breakfast nook in or very near the kitchen, where each person may help in serving his or her own breakfast.

Luncheon in city homes is a time when the family cannot all be together and the serving must be adjusted accordingly.

Any of the forms of service may be used when there are guests. It is advisable to use the one with which the various members of the family are most familiar. For large numbers, however, buffet service will be the easiest to manage.

Points on Service. There are pointers on serving meals which always apply, regardless of the style of service. Here are some of the important ones:

1. Plan menus which are not only adequate and attractive in themselves, but can be prepared and served with the equipment available.
2. Until it becomes a matter of routine, make a timed plan of work for each meal.
3. Set the table for each meal so that each dish, glass, and piece of silver will be in the proper place, where it is needed, with nothing extra:

Place knives to the right of each cover,[1] sharp edge toward the plate.

Place fork or forks to the left, tines up. (There should be enough space between the knife and fork for the plate.)

Place spoon or spoons to the right of the knife.

When more than one piece of silver is needed at either side of the cover, arrange in the order in which they are to be used, beginning at the outside and working toward the plate.

Place the napkin to the left of the fork, open edges toward the plate and edge of the table.

Place the glass at the tip of the knife.

Place the bread-and-butter plate, if one is used, at the tip of the fork. When there is a salad plate and no bread-and-butter plate, the salad is placed at the tip of the fork.

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[1] A "cover" is one place at the table.

Place all silver and napkins for each cover one inch from the edge of the table.

4. Serve hot dishes very hot and cold dishes chilled. (This means that dishes for hot foods should be warmed, and those for cold ones chilled in the refrigerator or other cool place.)

Remember that rules for table service, both laying covers and serving the food, usually have a sound reason behind them. If a rule has no reason for being, then it is not a good rule! The best rule for good table service is to do the job in the way which will cause the least inconvenience to those being served. For example, the reason there is a rule for placing glasses and knives to the right is that most people use the right hand for cutting and for drinking. Silver is placed one inch from the edge so that it shall not be easily knocked off the table.

FAMILY CO-OPERATION

There is real satisfaction to the homemaker to know that within the family food budget the family members have been provided with palatable meals that supply the needs for good nutrition. Simple meal plans and methods of preparation and service make it possible for other family members to contribute in the planning and marketing as well as in the preparation, service, and clearing up. Even though the contribution of some may be small, participation helps other family members to appreciate the amount of work required in providing three meals a day, and the importance of the job.

The social aspects of food service are also important. Mealtime offers opportunity for building family unity, understanding, and common interests. Each member can contribute to the relaxation and enjoyment of the group by promptness at mealtime, following good food and table habits, and reporting interesting experiences. Special meals, planned together, help celebrate birthdays. Thanksgiving and Christmas bring larger family groups to join in traditional meals. Refreshments make a contribution to wider social gatherings. Growth in family solidarity comes from working together as a family group on these simple enterprises connected with food service.

It is hoped that these pages have shown the importance of the foods in the daily meals. Food preparation has a scientific foundation which gives it interest and removes some of the frustrating experiences that result from not knowing "the reasons why" for simple processes. Perhaps you will be stimulated to develop artistic skill in simple cookery that will make food good to look at and to eat as well as good for you and your family. Co-operating as a family member gives useful experience and helps prepare one later for leadership responsibility in feeding a family the foods essential to health. Equally important, such experience will help you to develop work plans that allow participation by other family members and the satisfaction that comes from working together in a common family enterprise.

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Appendix

Table LXVI
Nutritive Value of One Pound of Selected Foods as Purchased

Table LXVII
Recommended Daily Dietary Allowances

Selected Films on Food Selection and Preparation

Menus for Two

Menus for Four

Acknowledgment for Table LXVI:

To the Bureau of Human Nutrition and Home Economics of the United States Department of Agriculture, in co-operation with the National Research Council, Miscellaneous Publication No. 572, United States Department of Agriculture.

Acknowledgment for Table LXVII:

Recommended Dietary Allowances, Reprint and Circular Series, No. 122, National Research Council, Washington, D.C. (September, 1948).

TABLE LXVI

Nutritive Value of One Pound of Selected Foods as Purchased

Food item	Nature of refuse	Refuse	Food energy	Protein	Fat	Carbohydrate	Calcium	Phosphorus	Iron	Vitamin A value	Thiamine	Riboflavin	Niacin	Ascorbic acid
MILK, CREAM, ICE CREAM, CHEESE														
Milk:		*Percent*	*Calories*	*Grams*	*Grams*	*Grams*	*Milligrams*	*Milligrams*	*Milligrams*	*International Units*	*Milligrams*	*Milligrams*	*Milligrams*	*Milligrams*
1. Buttermilk, cultured		0	161	15.9	0.5	23.2	(536)	(422)	(0.3)	(20)	(0.16)	(0.81)	(0.5)	(6)
2. Chocolate flavored [1]		0	340	14.5	10.0	48.1	495	413	.3	410	.15	.72	.5	0
3. Condensed, sweetened		0	1,485	36.8	38.1	248.8	1,239	1,035	(.9)	(1,930)	(.24)	(1.77)	(.9)	(5)
4. Dry skim		0	1,631	161.6	4.5	236.1	5,902	4,676	2.6	(190)	1.60	8.88	5.2	32
5. Dry whole		0	2,249	117.1	121.2	172.5	4,308	3,305	2.6	6,360	1.38	6.63	3.0	29
6. Evaporated, unsweetened		0	630	31.8	35.9	44.9	1,103	885	.8	1,820	.22	1.63	.9	5
7. Fresh skim		0	161	15.9	.5	23.2	(536)	(422)	(.3)	(20)	.16	(.81)	(.5)	(6)
8. Fresh whole		0	312	15.9	17.7	22.2	536	422	.3	(720)	.16	.78	.5	6
Cream; ice cream:														
9. Cream (20 percent), sweet or sour		0	943	13.2	90.8	18.2	(440)	(350)	(.3)	(3,750)	(.14)	(.64)	(.4)	(5)
10. Ice cream, plain [1]		0	953	18.2	55.8	94.4	599	472	.5	2,450	.17	.84	.5	1
Cheese:														
11. Cheddar type		0	1,784	108.5	146.6	7.7	3,963	2,769	(2.6)	7,920	.20	2.29	(.9)	(0)
12. Cottage		0	459	87.2	3.6	19.5	372	1,194	(2.1)	(150)	.08	1.32	(.5)	(0)
13. Cream		0	1,667	32.2	167.5	7.7	(1,353)	(944)	(.8)	10,050	(.06)	.65	.3	(0)
14. *Processed, canned [2]		0	1,734	99.4	144.4	9.1	3,251	3,773	3.5	5,720	.14	1.95	.5	(0)
15. All other		0	1,784	(108.5)	(146.6)	(7.7)	(3,963)	(2,769)	(2.6)	9,320	.19	2.36	.9	(0)
FATS, OILS														
16. *Army spread, canned [3]		0	2,551	23.6	257.4	35.0	1,108	1,094	2.3	12,790	.15	.85	.5	0
17. *Bacon, canned		0	3,197	35.9	336.0	7.3	64	173	4.1	(0)	1.17	.43	6.8	0
18. Bacon, medium fat, sliced		0	2,840	41.3	295	(5.0)	59	490	3.6	(0)	(1.91)	(.47)	(9.4)	0
18a. Bacon, medium fat, slab	Rind	6	2,676	38.9	278	(4.7)	56	461	3.4	(0)	(1.79)	(.44)	(8.8)	0
19. Butter		0	3,327	2.7	367.7	1.8	73	73	.9	[4] 15,000	.01	.05	.5	0
20. French dressing		0	1,922	3.6	177.1	78.5	(23)	(23)	(.5)	0	0	0	0	0
21. Lard; other shortening		0	4,086	0	454.0	0	0	0	0	0	(0)	(0)	(0)	0

NOTE: Asterisk indicates Army ration component; parentheses, imputed value.

[1] Calculated from ingredients.

[2] Cheddar type.

[3] Not less than 56 percent butter fat on dry solids basis, cheese curd, skim milk powder.

[4] Year-round average.

TABLE LXVI (Continued)

Nutritive Value of One Pound of Selected Foods as Purchased

Food item	Nature of refuse	Refuse	Food energy	Protein	Fat	Carbohydrate	Calcium	Phosphorus	Iron	Vitamin A value	Thiamine	Riboflavin	Niacin	Ascorbic acid
FATS, OILS—Continued		*Percent*	*Calories*	*Grams*	*Grams*	*Grams*	*Milligrams*	*Milligrams*	*Milligrams*	*International Units*	*Milligrams*	*Milligrams*	*Milligrams*	*Milligrams*
22. Margarine with vitamin A added		0	3,327	2.7	367.7	1.8	(9)	(68)	(0.9)	5 (9,000)	(0)	(0)	(0)	0
23. Mayonnaise		0	3,268	6.8	354	13.6	(86)	(272)	(4.5)	(950)	(.16)	(.16)	(0)	(0)
24. Salad dressing		0	1,776	5.0	167.1	63.1	(41)	(136)	(1.8)	(660)	(.07)	(.14)	(0)	(0)
25. Salad or cooking oil		0	4,086	0	454.0	0	0	0	0	0	0	0	0	0
26. Salt pork, fat	Rind	4	3,407	17.0	371	0	9	183	2.6	(0)	(.78)	(.19)	(3.8)	0
EGGS														
27. Egg yolk, fresh		0	1,612	74	144.8	3.2	667	2,660	32.7	14,590	1.47	2.34		0
28. *Eggs, whole, dried		0	2,692	(218.8)	(196.6)	(11.8)	849	3,632	39.5	20,240	1.59	5.59	1.0	(0)
29. Eggs, whole, fresh	Shell	11	636	51.7	46.5	2.8	218	848	10.9	4,590	.47	1.35	.3	(0)
MEAT, POULTRY, FISH														
Beef:														
Thin—Utility, Grade C:														
30. Carcass; side, including kidney fat	Bone	19	745	69.2	52	0	40	747	10.3	(0)	.43	.55	18.7	0
Medium—Commercial, Grade B:														
31. Carcass; side, including kidney fat	Bone	16	1,023	66.7	84	0	38	720	9.9	(0)	.41	.53	18.0	0
32. Carcass trimmed to retail basis	Bone	16	890	69.4	68	0	40	748	10.4	(0)	.43	.55	18.7	0
33. *Chopped meat 6		0	1,480	73.1	132	0	41	790	10.9	(0)	.45	.58	19.7	0
34. *Roasting meat, boned 6		0	874	85.8	59	0	50	926	12.7	(0)	.53	.68	23.2	0
35. *Stewing meat, boned 6		0	1,068	82.6	82	0	50	890	12.3	(0)	.51	.65	22.3	0
Fat—Good, Grade A:														
36. Carcass; side, including kidney fat	Bone	15	1,224	62.9	108	0	39	679	9.3	(0)	.39	.50	17.0	0
Very fat—Choice, Prime, Grade AA:														
37. Carcass; side, including kidney fat	Bone	12	1,623	54.8	156	0	32	592	8.4	(0)	.34	.43	14.8	0

	Retail items: [7]														
39.	*Corned beef, canned		0	1,056	110.8	68.1	0	132	513	18.2	(0)	.07	.87	12.4	0
40.	Corned beef, medium, boneless		0	1,313	71.7	114	0	41	772	10.9	(0)	.23	.45	7.7	0
41.	Dried or chipped		0	880	155.7	28.6	0	91	1,680	23.2	(0)	.49	.99	16.8	0
42.	Hamburger		0	1,433	72.6	127	0	41	781	10.9	(0)	.45	.57	19.6	0
44.	Rib roast, rolled (wholesale rib)		0	1,252	79.0	104	0	45	854	11.8	(0)	.49	.62	21.3	0
44a.	Rib roast, standing (wholesale rib)	Bone	21	997	62.5	83	0	36	675	9.3	(0)	.39	.49	16.9	0
45.	*Roast, canned		0	985	113.5	59	0	41	745	10.0	(0)	.07	1.08	20.4	0
46.	Round steak (wholesale round)	Bone	11	789	78.0	53	0	44	840	11.7	(0)	.48	.61	21.0	0
47.	Rump roast, bone in (wholesale rump)	Bone	24	1,177	53.5	107	0	31	576	7.9	(0)	.33	.42	14.4	0
47a.	Rump roast, boned (wholesale rump)		0	1,551	70.4	141	0	41	758	10.4	(0)	.44	.55	19.0	0
48.	Soup bone and meat (wholesale shanks)	Bone	49	377	47.1	21	0	28	508	7.0	(0)	.29	.37	12.7	0
49.	Stew meat, boneless (73 percent lean)		0	1,511	71.7	136	0	41	772	10.9	(0)	.44	.57	19.4	0
	Lamb:														
	Carcass; side:														
50.	Thin	Bone	31	631	53.5	46.3	0	31	576	8.1	(0)	.63	.79	17.7	0
51.	Intermediate	Bone	22	1,105	55.6	98.1	0	32	598	8.5	(0)	.65	.82	18.3	0
52.	Fat	Bone	19	1,510	47.8	146.5	0	29	515	7.4	(0)	.56	.70	15.8	0
	Retail items, [7] intermediate grade:														
53.	Leg roast (wholesale leg)	Bone	17	866	67.9	66.0	0	38	731	10.2	(0)	.80	1.00	22.4	0
54.	Shoulder roast (wholesale 3-rib shoulder)	Bone	20	1,053	56.6	91.8	0	33	610	8.3	(0)	.66	.83	18.7	0
	Pork:														
	Packers' carcass; side:														
56.	Thin	Bone and skin	18	1,380	52.5	130	0	30	565	7.8	(0)	3.32	.65	14.2	0
57.	Medium	Bone and skin	12	1,810	47.6	180	0	28	512	7.2	(0)	3.01	.59	12.8	0
58.	Fat	Bone and skin	10	2,185	40.1	225	0	25	434	6.1	(0)	2.53	.50	10.8	0
59.	Miscellaneous lean cuts [8]	Bone and skin	17	1,330	54.9	123.4	0	32	592	8.2	(0)	3.47	.68	14.8	0
	Retail items: [7]														
	Bacon. See Fats, Oils.														
60.	Boston butt	Bone	5	1,177	71.5	99	0	43	771	10.8	(0)	4.52	.89	19.3	0

NOTE: Asterisk indicates Army ration component; parentheses, imputed value.

[5] Plain margarine is considered to have no vitamin A value.

[6] Average values for composition of all cuts in a boned and trimmed carcass of commercial grade generally used for: (a) Chopped meat; (b) roasting and broiling; (c) stewing and boiling.

[7] Values for fresh items are from the medium fat wholesale cuts considered to be nearest approximations for corresponding retail items.

[8] Lean cuts from medium fat carcass weighted according to civilian supply, 1944. Excludes bacon, lard, salt side, fat back.

TABLE LXVI (Continued)

Nutritive Value of One Pound of Selected Foods as Purchased

Food item	Nature of refuse	Refuse	Food energy	Protein	Fat	Carbohydrate	Calcium	Phosphorus	Iron	Vitamin A value	Thiamine	Riboflavin	Niacin	Ascorbic acid
MEAT, POULTRY, FISH—Continued														
Pork—Continued:														
Retail items—Continued: [7]		*Percent*	*Calories*	*Grams*	*Grams*	*Grams*	*Milligrams*	*Milligrams*	*Milligrams*	*International Units*	*Milligrams*	*Milligrams*	*Milligrams*	*Milligrams*
61. Ham, fresh	Bone and skin	14	1,326	59.3	121	0	35	640	9.0	(0)	3.75	.73	16.0	0
62. Ham, smoked	Bone and skin	13	1,514	66.8	138	(1.2)	40	719	9.9	(0)	3.08	0.76	15.1	0
63. Loin; loin chops	Bone	19	1,070	60.4	92	0	37	651	9.2	(0)	3.81	.75	16.3	0
64. Picnic	Bone and skin	18	1,291	55.1	119	0	33	595	8.2	(0)	3.48	.68	14.9	0
65. Pork links; sausage		0	2,027	49.0	203.4	0	27	527	7.3	(0)	1.02	.68	10.4	0
Salt pork. See Fats, Oils.														
66. Spareribs	Bone	40	942	39.7	87	0	22	427	6.0	(0)	2.51	.49	10.7	0
Veal:														
Carcass; side, excluding kidney fat:														
67. Thin	Bone	23	528	69.0	28	0	38	742	10.5	(0)	.63	.97	22.8	0
68. Medium	Bone	21	661	68.6	43	0	39	740	10.4	(0)	.62	.97	22.6	0
69. Fat	Bone	19	803	68.1	59	0	40	732	10.3	(0)	.62	.96	22.4	0
Retail items, [7] medium fat:														
71. Cutlet (wholesale round), boneless		0	723	88.5	41	0	50	953	13.2	(0)	.80	1.25	29.2	0
73. Stew meat (58 percent lean)	Bone	21	812	65.7	61	0	39	707	9.7	(0)	.60	.93	21.7	0
Variety meats, meat mixtures:														
74. *Beef and gravy, canned [9]		0	854	88.1	53.1	5.9	86	554	12.3	(140)	.40	.87	12.3	0
75. Bologna		0	984	67.2	72.2	16.3	41	726	10.0	(0)	1.41	1.36	13.8	0
76. *Chile con carne, without beans, canned. [10]		0	898	46.3	66.3	29.1	95	690	3.2	700	.05	.45	9.5	0
77. Frankfurters		0	912	69.0	64.0	15.0	41	745	10.4	(0)	.86	1.04	10.7	0
78. *Ham and eggs, canned [11]		0	1,031	65.4	83.1	5.4	195	754	10.0	2,300	.72	1.08	7.8	0
79. *Hash, corned beef, canned [12]		0	651	68.6	27.7	31.8	118	(409)	5.9	(0)	.07	.60	10.8	0
80. *Hash, meat and vegetable, canned [13]		0	555	45.4	22.7	42.2	64	(300)	5.4	(0)	.16	.52	11.4	26
81. Heart, fresh		0	570	(74.9)	(28.6)	(3.2)	45	1,071	28.1	(0)	2.46	4.07	30.9	63
82. Liver, fresh		0	597	(89.9)	(19.1)	(16.3)	36	1,693	54.9	87,000	1.23	12.73	73.0	140
83. Liver sausage		0	1,172	75.8	93.5	6.8	41	1,081	24.5	(26,000)	.76	5.07	20.7	(0)
84. *Luncheon meat, canned [14]		0	1,227	69.0	102.2	7.7	95	772	6.4	(0)	1.32	.94	12.2	0
85. *Pork and gravy, canned [15]		0	935	69.9	69.0	8.6	73	735	7.3	(0)	.87	1.07	12.2	0

86. *Pork sausage, bulk, canned		0	1,271	72.6	109.0	0	77	595	10.0	(0)	.86	.94	12.8	0
87. *Spaghetti with meat, canned [16]		0	645	44.5	31.3	46.3	173	440	8.2	2,180	.10	.56	9.9	
88 *Stew, meat and vegetable, canned [17]		0	577	52.7	25.0	35.4	163	(617)	6.4	8.060	.19	.56	11.0	20
89. Tongue, fresh, medium fat	Skin	5	875	70.7	65.0	1.7	129	513	29.7	(0)	.95	1.16	21.6	0
90. *Vienna sausage, canned		0	952	72.6	73.5	0	86	(745)	2.7	(0)	.34	.61	13.9	0
Poultry:														
91. *Chicken, boned, canned		0	796	99.0	44.5	0	145	(990)	(8.6)	Trace	.05	.69	16.8	11
92. Chicken, roasters, dressed [18]	Head, feet, bone, inedible viscera.	39	538	56.0	34.9	0	44	604	5.3	Trace	.31	.49	23.8	
93. Turkey, medium fat, dressed [18]	Head, feet, bone, inedible viscera.	33	797	61.3	61.3	0	70	973	11.6	Trace	.38	.58	24.0	
Fish and shellfish:														
94. Cod steaks	Bones	9	288	68.1	1.7	0	74	781	3.7		.19	.22	9.3	8
Fish, miscellaneous, medium fat:														
95. Drawn	Head, tail, bones and fins	52	214	41.4	5.4	0	46	475	2.2		.15	.14	9.0	(4)
95a. Dressed	Bones	33	300	57.8	7.6	0	64	663	3.0		.20	.20	12.6	(6)
95b. Steaks or sections	Bones	16	375	72.4	9.5	0	80	831	3.8		.25	.25	15.8	(8)
95c. Whole	Head, tail, entrails, bones, fins.	55	201	38.8	5.1	0	43	445	2.0		.14	.13	8.5	(4)
96. Oysters, fresh, shucked, solids and liquor.		0	225	27.2	5.4	16.8	309	781	32.2		.84	1.04	5.7	
97. Salmon, canned		0	766	93.5	43.6	0	304	1,298	5.9	[19] 370	.15	.80	29.6	0
98. Sardines, canned in oil	Oil	18	768	95.6	40.9	4.5	130	1,358	6.7	1.080	.21	.43	19.4	0
99. Sardines, canned in oil, total contents of can.		0	1,504	95.6	122.6	4.5	130	1,358	6.7	3,040	.21	.43	19.4	0
100. Shrimp, canned		0	370	80.8	3.6	3.6	(340)	(953)	(9.1)	280	.04	.14	8.6	0
101. Tuna fish, canned	Liquor	14	728	108.0	46.0	0	133	1,131	6.6	270	.16	.51	41.3	0
102. Tuna fish, canned, total contents of can.		0	1,337	108.5	100.3	0	136	1,144	6.8	590	.17	.51	41.8	0

NOTE: Asterisk indicates Army ration component; parentheses, imputed value.

[7] Values for fresh items are from the medium fat wholesale cuts considered to be nearest approximations for corresponding retail items.

[9] 90 percent beef, 10 percent tomato gravy.

[10] Not less than 60 percent meat, not more than 8 percent cereals, seasonings.

[11] 50 percent ham, 50 percent whole eggs.

[12] 72 percent beef, 28 percent potatoes.

[13] 50 percent meat, 48 percent potatoes, 2 percent onions.

[14] Pork.

[15] 90 percent pork, 10 percent gravy.

[16] 50 percent meat, 10 percent dry spaghetti, 30 percent tomato puree, 5 percent cheese, 5 percent onions.

[17] 50 percent meat, 15 percent potatoes, 15 percent carrots, 8 percent dry beans, 12 percent tomato puree.

[18] Vitamin values based on muscle meat only.

[19] Based on pink salmon. Canned red salmon may have a value several times higher.

TABLE LXVI (Continued)

Nutritive Value of One Pound of Selected Foods as Purchased

Food item	Nature of refuse	Refuse	Food energy	Protein	Fat	Carbohydrate	Calcium	Phosphorus	Iron	Vitamin A value	Thiamine	Riboflavin	Niacin	Ascorbic acid
DRY BEANS AND PEAS, NUTS														
Dry beans and peas:		*Percent*	*Calories*	*Grams*	*Grams*	*Grams*	*Milligrams*	*Milligrams*	*Milligrams*	*International Units*	*Milligrams*	*Milligrams*	*Milligrams*	*Milligrams*
103. *Bean soup, navy, dehydrated [20]		0	1,508	79.9	5.5	284.7	(672)	(2,102)	(46.8)	(0)	2.07	0.98	10.8	5
104. Beans, canned, baked		0	531	25.9	9.1	86.3	(222)	(699)	(15.4)	[21] 310	.22	.21	3.6	[21] 16
105. Beans, common or kidney, dry seed		0	1,588	99.9	6.8	281.9	672	2,102	46.8	0	2.71	1.07	9.6	8
106. Beans, lima, dry seed		0	1,548	94.0	5.9	279.7	309	1,730	34.0	0	2.71	1.07	9.6	8
107. Chickpeas		0	1,675	94.4	21.3	276.5	418	1,702	32.2	Trace	1.59	.68	6.4	(8)
108. Cowpeas		0	1,592	104.0	6.4	279.7	363	2,043	35.4	0	3.76	1.05	10.1	8
109. *Pea soup, dehydrated [22]		0	1,523	92.6	5.4	276.0	(331)	(1,802)	(27.2)	990	2.81	.94	14.3	11
110. Peas, split		0	1,606	111.2	4.5	280.1	331	1,802	27.2	1,680	3.94	1.30	13.8	9
111. Soybeans, whole, mature		0	1,591	158.4	82.2	[23] (54.5)	1,031	2,660	36.3	490	5.18	1.40	9.4	Trace
Soy flour; flakes; grits:														
112. Low fat		0	1,115	202.9	5.0	[23] (64.5)	1,203	2,828	59.0	300	4.99	1.58	13.0	(0)
113. Medium fat		0	1,284	193.0	29.5	[23] (61.7)	1,108	2,769	59.0	500	3.70	1.53	11.8	(0)
114. Full fat		0	1,701	163.0	93.5	[23] (51.8)	885	2,511	54.9	640	3.51	1.28	9.9	(0)
Nuts:														
115. Almonds	Shells	49	1,484	43.2	125.5	45.5	589	1,102	10.2	0	.57	1.55	10.6	Trace
116. Peanut butter		0	2,808	118.5	217.0	95.3	336	1,784	8.6	0	.89	.72	73.5	(0)
117. Peanuts, roasted	Shells and red skins	28	1,961	88.0	144.5	77.2	242	1,285	6.2	0	[24] .96	.52	53.0	(0)
118. Pecans	Shells	48	1,762	22.2	172.3	30.7	175	765	5.7	120	1.69	.27	2.1	4
119. Walnuts, English	Shells	55	1,432	30.6	131.4	31.8	169	775	4.3	70	.98	.27	2.4	6
VEGETABLES														
Fresh:														
120. Asparagus	Butt ends	25	90	7.5	.7	13.3	71	211	3.1	3,430	.54	.59	3.9	113
121. Beans, lima, green	Pods	60	239	13.6	1.5	42.8	115	288	4.2	520	.45	.26	1.7	58
122. Beans, snap	Ends and strings	10	172	9.8	.8	31.5	266	180	4.5	2,560	.32	.41	2.5	79
123. Beet greens	Inedible leaves and stems	25	112	6.8	1.0	19.0	[25]	153	10.9	22,700	.18	.57	1.1	115
124. Beets	Skins, root ends and base of stems.	25	155	5.4	.3	32.6	92	146	3.4	80	.11	.17	1.4	34
125. Broccoli	Leaves and tough stalks	39	103	9.1	.6	15.2	360	211	3.6	9,700	.26	.59	2.5	327
126. Brussels sprouts	Outer leaves	23	203	15.4	1.8	31.2	119	273	4.6	1,390	.40	(.22)	(.9)	328

127.	Cabbage	Outer leaves and core	27	95	4.6	.7	17.5	152	103	1.7	270	.23	.21	.9	173
128.	Carrots	Scrapings	12	179	4.8	1.2	37.2	156	148	3.2	48,000	.27	.26	2.0	24
129.	Cauliflower	Main stalk and leaf stalks	55	63	4.9	.4	10.0	45	147	2.2	200	.21	.22	1.2	141
130.	Celery	Leaves and trimmings	37	63	3.7	.6	10.6	143	114	1.4	0	.09	.12	.9	20
131.	Chard	Inedible leaves and trimmings.	14	98	5.5	.8	17.2	[26]	140	15.6	10,920	.22	.51	.9	148
132.	Collards	Tough stalks and some leaves.	55	102	8.0	1.2	14.7	508	118	3.3	14,020	.44	(.42)	(1.7)	203
133.	Corn, sweet, white or yellow	Husks and cob	62	186	6.4	2.1	35.5	16	208	.9	[27] 680	.27	.24	2.4	20
134.	Cucumbers	Parings	30	46	2.2	.3	8.6	32	67	1.0	[28] 0	.12	.28	.5	27
135.	Dandelion greens	Main stalk and inedible leaves.	(25)	178	9.2	2.4	29.9	636	238	10.5	46,410	.64	.49	(2.9)	122
136.	Eggplant	Calyx and parings	13	111	4.3	.8	21.7	59	146	1.6	100	.27	.22	3.2	19
137.	Kale	Stalks, outer leaves, in some cases midribs.	36	144	11.3	1.7	21.0	655	180	6.4	21,950	.35	1.01	(2.4)	335
138.	Lettuce, headed	Stalks and outer leaves	31	57	3.8	.6	9.1	69	78	1.6	1,710	.20	.21	.5	24
139.	Lettuce, all other	Stalks and outer leaves	31	57	3.8	.6	9.1	194	63	3.4	5,060	.20	.21	.5	57
140.	Mustard greens	Stalks and outer leaves	27	92	7.6	1.0	13.2	728	126	9.6	21,370	.31	.68	2.8	338
141.	Okra	Stem ends	12	154	7.2	.8	29.6	328	248	2.8	2,950	.49	.42	2.8	121
142.	Onions, mature	Skins and rootlets	6	208	6.0	.9	44.0	137	188	2.1	210	.15	.10	.6	[29] 38
143.	Parsnips	Scrapings	22	295	5.3	1.8	64.4	202	283	2.5	0	.40	.32	.7	63
144.	Peas, green	Pods	55	206	13.7	.8	36.1	45	249	3.9	1,390	.72	.37	4.2	54
145.	Peppers, green	Stem ends, seeds, and cores	16	112	4.6	.8	21.7	42	95	1.5	2,410	.27	.17	1.4	457
146.	Potatoes	Parings	16	325	7.6	.4	72.8	42	213	2.7	70	.40	.15	4.4	64
147.	Pumpkin	Rind and contents of cavity	31	112	3.8	.6	22.8	66	138	2.5	(10,640)	(.15)	(.24)	(1.8)	26
148.	Radishes	Tops and rootlets	51	50	2.7	.2	9.3	82	69	2.2	70	.10	.08	.3	54
149.	Rutabagas	Parings	15	158	4.2	.4	34.4	212	158	1.5	1,280	.25	.23	1.8	140
150.	Spinach	Main stalk and outer leaves	18	92	8.6	1.1	11.9	[30]	205	11.2	35,040	.44	.90	2.6	219
151.	Squash, summer	Stem ends	3	83	2.6	.4	17.2	66	66	1.8	1,140	.18	.23	5.0	75
152.	Squash, winter	Rind and contents of cavity	26	147	5.0	1.0	29.6	64	94	2.0	16,640	.16	.26	1.9	28
153.	Sweetpotatoes	Parings	14	488	7.0	2.7	108.8	117	191	2.7	[31] 30,030	.37	.23	2.8	86

NOTE: Asterisk indicates Army ration component; parentheses, imputed value.

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[20] Navy bean meal, farinaceous flour up to 15 percent.

[21] Contributed by tomatoes.

[22] Pea meal, farinaceous flour up to 15 percent.

[23] "Available" carbohydrate.

[24] Based on peanuts without skins; when skins are included, the thiamine value is higher.

[25] 401 mg.; may not be available because of presence of oxalic acid.

[26] 410 mg.; may not be available because of presence of oxalic acid.

[27] Based on yellow corn; white corn contains only a trace.

[28] Based on pared cucumber; unpared contains about 830 I. U. of vitamin A per pound as purchased.

[29] Green bunching onions contain about 43 mg. of ascorbic acid per pound as purchased.

[30] 301 mg.; may not be available because of presence of oxalic acid.

[31] If pale varieties only were used, the value would be very much lower.

TABLE LXVI (Continued)

Nutritive Value of One Pound of Selected Foods as Purchased

Food item	Nature of refuse	Refuse	Food energy	Protein	Fat	Carbohydrate	Calcium	Phosphorus	Iron	Vitamin A value	Thiamine	Riboflavin	Niacin	Ascorbic acid
VEGETABLES—Continued														
Fresh—Continued:		*Percent*	*Calories*	*Grams*	*Grams*	*Grams*	*Milligrams*	*Milligrams*	*Milligrams*	*International Units*	*Milligrams*	*Milligrams*	*Milligrams*	*Milligrams*
154. Tomatoes	Skins, stem end, inedible flesh.	12	91	4.0	1.2	16.0	44	108	2.4	4,380	.24	.16	2.5	93
155. Turnip greens	Discarded leaves	16	140	11.0	1.5	20.6	987	190	9.1	36,370	0.37	2.15	2.9	518
156. Turnips	Parings	13	136	4.3	.8	28.0	158	134	2.0	20	.26	.24	1.8	113
Canned:														
157. Asparagus		0	96	7.3	1.4	13.6	91	154	4.5	[32] 2,750	.29	.39	3.7	67
158. Beans, lima		0	327	17.3	1.4	61.3	123	331	7.7	590	.16	.22	2.2	36
159. Beans, snap		0	87	4.5	0	17.3	123	86	6.4	1,880	.14	.22	1.5	18
160. Beets		0	176	4.5	0	39.5	68	132	2.7	80	.05	.13	.5	21
161. Carrots		0	136	2.3	1.8	27.7	100	109	2.7	54,480	.12	.10	1.5	10
162. Corn, white or yellow		0	350	9.1	2.3	73.1	18	232	2.3	[27] 920	.11	.21	3.8	24
163. Peas, green		0	312	15.4	1.8	58.6	114	304	8.2	2,470	.48	.26	4.1	39
164. Pumpkin		0	174	4.5	1.4	35.9	(91)	(163)	(3.2)	15,440	.07	.28	2.5	(0)
165. Sauerkraut		0	90	5.0	.9	15.4	(209)	(141)	(2.3)	50	.14	.91	1.0	[33] 80
166. Spinach		0	112	10.4	1.8	13.6	[34]	150	7.3	30,830	.09	.38	1.4	66
167. Tomato catsup		0	497	9.1	1.8	111.2	54	82	3.6	(8,540)	.41	.32	10.2	51
168. Tomato juice		0	104	4.5	.9	19.5	(32)	(68)	(1.8)	4,770	.23	.15	3.2	72
169. Tomato puree		0	184	8.2	2.3	32.7	(50)	(168)	(5.0)	8,540	.40	(.32)	8.1	126
170. Tomatoes		0	97	4.5	.9	17.7	(50)	(123)	(2.7)	4,770	.23	.15	3.2	75
Dehydrated: [35]														
171. *Cabbage, unsulfited [36]		0	1,572	62.2	8.2	312.4	1,698	1,244	21.3	2,350	1.86	1.67	10.9	858
172. *Carrots		0	1,639	18.2	6.4	377.2	(1,099)	(463)	(26.8)	531,180	1.32	1.27	14.5	50
173. *Onions		0	1,590	45.9	4.5	341.4	717	1,162	14.1	90	1.04	.68	5.0	168
174. *Potatoes		0	1,647	32.2	3.2	372.3	114	468	16.8	(0)	1.15	.45	21.8	118
175. *Sweetpotatoes		0	1,693	23.2	4.1	390.9	(345)	(340)	(10.4)	99,290	.81	.62	8.6	156
FRUIT														
Fresh:														
176. Apples	Skins and core	12	258	1.2	1.6	59.6	24	40	1.2	360	.15	.08	1.0	18
177. Apricots	Pits	6	241	4.3	.4	55.1	68	98	2.1	11,930	.13	.17	3.2	15

178.	Avocados	Seeds and skins	25	901	5.8	89.8	17.3	34	129	2.0	970	.42	.51	3.7	54
179.	Bananas	Skins	33	299	3.6	.6	69.9	24	85	1.8	1,300	.27	.19	1.7	29
	Berries:														
180.	Blueberries		0	310	2.7	2.7	68.6	73	59	3.6	1,290	(.12)	(.30)	(1.3)	74
181.	Strawberries	Stems and caps	4	179	3.5	2.6	35.3	122	118	3.5	250	.13	.29	1.3	261
182.	Other berries		0	294	5.4	3.6	59.9	163	154	4.1	1,460	.12	(.30)	(1.3)	106
183.	Cantaloups	Rind and cavity contents	53	48	1.3	.4	9.8	36	34	.9	[37] 7,290	.12	.08	1.7	69
184.	Grapefruit	Rind and seeds	34	133	1.5	.6	30.3	51	54	.9	(70)	.11	.06	.6	121
185.	Grapes	Seeds and stems	3	324	3.5	1.8	73.5	75	92	2.6	330	.24	.12	1.9	17
186.	Lemons	Rind and seeds	38	123	2.5	1.7	24.4	(39)	(28)	(.3)	0	.13	.01	.4	127
187.	Limes	Rind and seeds	24	184	2.8	.3	42.4	(48)	(34)	(.3)	0	(.16)	(.02)	(.5)	94
188.	Oranges	Rind and seeds	28	164	2.9	.7	36.6	108	75	1.3	(620)	.25	.08	.8	162
189.	Peaches	Pits and skins	12	204	2.0	.4	48.0	32	88	2.4	3,530	.08	.19	3.6	31
190.	Pears	Skins and core	17	262	2.6	1.5	59.6	49	60	1.1	90	.08	.16	.5	16
191.	Pineapples	Crown; core, and parings	47	140	1.0	.5	33.0	39	27	.7	310	.20	(.06)	(.5)	57
192.	Plums	Pits	5	242	3.0	.9	55.6	73	86	2.2	1,510	.63	(.13)	2.4	20
193.	Rhubarb	Leaves	32	56	1.5	.3	11.7	[38]	77	1.5	100	.03	--------	.3	28
194.	Tangerines; other mandarin type oranges.	Rind and seeds	29	160	2.6	1.0	35.1	(106)	(74)	(1.3)	(1,360)	.22	(.08)	(.8)	99
195.	Watermelons	Rind and seeds	54	65	1.0	.4	14.4	15	25	.4	1,240	.10	.11	.4	13
	Canned:														
196.	Apples; applesauce		0	366	.9	.5	89.4	(18)	(27)	(.9)	(270)	.05	.05	.2	5
197.	Apricots	Pits	4	387	2.6	.4	93.3	(44)	(65)	(1.3)	5,900	.07	.10	1.4	17
198.	Cherries	Pits	4	377	2.6	.4	90.7	(48)	(61)	(1.3)	(1,870)	.13	.09	.8	14
199.	Cranberry sauce		0	948	.5	1.4	233.4	(36)	(32)	(1.4)	(140)	--------	(.18)	--------	8
200.	Fruit cocktail		0	353	(1.8)	(.9)	(84.4)	(41)	(54)	(1.8)	730	.05	.05	1.6	9
201.	Grapefruit juice		0	188	2.3	.9	42.7	36	54	1.8	60	.13	.08	1.0	158
202.	Grapefruit segments		0	366	2.7	.9	86.7	59	64	1.4	60	.13	.08	1.0	134
203.	Orange juice		0	250	2.7	.5	58.6	(150)	(104)	(1.8)	(450)	.31	.08	1.0	191
204.	Peaches		0	342	1.8	.5	82.6	(23)	(64)	(1.8)	2,030	.03	.09	3.1	19
205.	Pears		0	342	.9	.5	83.5	(36)	(45)	(.9)	20	.04	.08	.6	8
206.	Pineapple juice		0	246	1.4	.5	59.0	68	36	2.3	360	.24	.07	.8	41
207.	Pineapples		0	395	1.8	.5	95.8	132	32	2.7	360	.32	.07	.8	41
208.	Plums; Italian prunes	Pits	4	366	1.7	.4	88.9	35	52	4.8	(990)	.12	.11	1.6	5

NOTE: Asterisk indicates Army ration component; parentheses, imputed value.

[27] Based on yellow corn; white corn contains only a trace.

[32] Based on green products; bleached products contain only a trace.

[33] Drained solids only.

[34] 409 mg.; may not be available because of presence of oxalic acid.

[35] Freshly dehydrated products; some loss of vitamins is to be expected during storage.

[36] If sulfited, the thiamine value would be much lower, and the ascorbic acid value would be about double.

[37] Based on deeply colored varieties.

[38] 158 mg.; may not be available because of presence of oxalic acid.

TABLE LXVI (Continued)

Nutritive Value of One Pound of Selected Foods as Purchased

Food item	Nature of refuse	Refuse	Food energy	Protein	Fat	Carbohydrate	Calcium	Phosphorus	Iron	Vitamin A value	Thiamine	Riboflavin	Niacin	Ascorbic acid
FRUIT—Continued														
Dried:		*Percent*	*Calories*	*Grams*	*Grams*	*Grams*	*Milli-grams*	*Milli-grams*	*Milli-grams*	*International Units*	*Milli-grams*	*Milli-grams*	*Milli-grams*	*Milli-grams*
209. *Apple nuggets		0	1,771	6.4	4.5	426.3	109	191	18.6	(0)	0.24	0.35	2.3	50
210. Apricots [39]		0	1,325	23.6	1.8	303.7	390	540	22.2	33,730	.06	.71	15.0	57
211. *Cranberries		0	1,856	13.2	30.0	383.2	372	100	15.4	3,000	.87	.84	4.1	149
212. Peaches [39]		0	1,339	13.6	2.7	315.1	200	572	31.3	14,760	.04	.89	24.5	86
213. Prunes [40]		15	1,153	8.9	2.3	274.1	208	328	15.0	7,300	.38	.64	6.6	11
214. Raisins [40]		0	1,355	10.4	2.3	323.2	354	586	15.0	230	.69	.37	2.2	Trace
Synthetic fruit powders, canned:														
215. *Grape juice [41]		0	[42] 1,135	.5	2.3	14.1	599	295	.5	(0)	0	(0)	(0)	2,724
216. *Lemon juice [43]		0	[42] 1,525	1.8	1.4	276.0	272	150	6.8	(0)	(0)	(0)	(0)	3,977
217. *Orange juice [44]		0	[42] 1,548	5.0	.9	295.6	817	459	10	(0)	(0)	(0)	(0)	4,209
GRAIN PRODUCTS														
Flour, meal:														
Corn meal:														
218. White, degerminated		0	1,612	34.0	5.0	357.8	45	636	4.5	(0)	.72	.42	4.3	0
219. White, whole-grain		0	1,658	41.3	16.8	335.5	82	1,126	12.3	(0)	1.86	.55	7.9	0
220. Yellow, degerminated		0	1,615	37.7	5.4	354.1	45	636	4.5	1,360	.68	.27	4.1	0
221. Yellow, whole-grain		0	1,658	41.3	16.8	335.5	82	1,253	12.3	2,330	2.04	.75	9.3	0
222. Cornstarch		0	1,597	2.3	.9	395.0	Trace	Trace	Trace	(0)	(0)	(0)	(0)	0
Flour:														
223. Buckwheat, light		0	1,607	28.6	5.0	361.8	50	400	4.5	(0)	[45] 1.41	[45] .36	[45] 9.5	0
224. Rye, light		0	1,624	40.4	4.1	356.4	82	1,262	5.9	(0)	.68	.31	4.1	0
225. Rye, whole-grain		0	1,638	50.8	7.7	341.4	277	1,675	21.8	(0)	2.13	.94	7.9	0
Soy. See Dry Beans and Peas.														
226. Wheat, patent		0	1,611	49.0	4.1	344.6	86	422	3.0	(0)	.30	.15	3.5	0
227. Wheat; patent, enriched		0	1,611	49.0	4.1	344.6	86	422	(13.2)	(0)	(2.0)	(1.2)	(16.0)	0
228. Wheat, self-rising		0	1,546	46.3	4.1	331.0	1,000	1,500	2.7	(0)	.10	.10	3.0	0
229. Wheat; self-rising, enriched		0	1,546	46.3	4.1	331.0	1,000	1,500	(13.2)	(0)	(2.0)	(1.2)	(16.0)	0
230. Whole wheat		0	1,633	59.0	9.1	328.7	173	1,748	17.3	(0)	2.53	.56	25.3	0

	Baked goods:														
	Bread:														
231.	Rye, light		0	1,194	(29.1)	(15.4)	(234.7)	(100)	(436)	(3.6)	(0)	.71	(.18)	(5.0)	0
232.	White, enriched		0	1,186	38.6	9.1	237.4	(254)	(454)	(8.2)	(0)	(1.10)	(.70)	(10.0)	0
233.	Whole wheat		0	1,187	43.1	15.9	217.9	(272)	1,680	11.8	(0)	1.28	.70	16.1	0
234.	Cake, light batter type		0	1,486	29.1	37.2	258.8	281	(572)	9.1	---------	.15	.44	3.0	0
235.	Cookies, assorted, plain		0	1,990	27.2	57.7	340.5	(100)	(295)	(2.7)	(0)	(.16)	(.16)	(2.3)	0
236.	Cracker-meal; crackers, assorted		0	1,914	43.1	46.8	330.1	100	463	6.8	(0)	(.31)	(0)	(2.7)	0
237.	Crackers, graham		0	1,903	36.3	45.4	337.3	91	922	8.6	(0)	1.36	.54	6.8	0
238.	Fig bars		0	1,649	19.1	21.8	344.1	(313)	(313)	(5.9)	(0)	(.11)	(.27)	(4.1)	(0)
239.	Pie, apple		0	1,208	(13.2)	(43.6)	(190.7)	(50)	(100)	8.6	(0)	(.23)	(.18)	1.8	(0)
240.	Pie, cream		0	1,014	(12.7)	(44.5)	(140.7)	91	(173)	2.3	(0)	.15	.38	.9	(0)
241.	Rolls, plain, enriched		0	1,380	37.2	27.7	245.6	(254)	(454)	(8.2)	(0)	(1.10)	(.70)	(10.0)	0
242.	Rolls, sweet, unenriched		0	1,379	35.4	24.5	254.2	(254)	(454)	2.2	(0)	.35	.60	3.5	0
	Breakfast cereals:														
243.	Corn flakes		0	1,631	35.9	3.2	364.6	(45)	254	(4.5)	(0)	(.72)	.39	7.2	0
	Corn flakes, restored. See page 4.														
244.	Oatmeal		0	1,799	64.5	33.6	309.6	245	1,657	23.6	(0)	2.49	.63	5.2	0
245.	Rice flakes; puffed rice		0	1,647	32.7	1.8	375	(41)	(418)	4.1	(0)	(.23)	(.12)	(6.3)	0
	Rice flakes; puffed rice, restored. See page 4.														
	Wheat cereals:														
246.	Farina		0	1,631	52.2	4.5	345.5	95	568	3.6	(0)	.28	.25	4.4	0
247.	Farina, enriched		0	1,631	52.2	4.5	345.5	95	568	(6)	(0)	(1.66)	(1.2)	(6)	0
248.	Flakes; puffed wheat		0	1,688	54.0	6.8	352.8	150	1,603	16.8	(0)	.67	.56	19.3	0
	Flakes; puffed wheat, restored. See page 4.														
249.	Shredded wheat		0	1,676	47.2	6.4	357.3	(173)	(1,748)	(17.3)	(0)	.93	.66	19.0	0
250.	Whole-grain, uncooked		0	1,671	53.1	9.1	344.1	173	1,748	17.3	(0)	2.02	.59	20.7	0
	Other cereals:														
251.	Barley, pearled, light		0	1,620	37.2	4.5	357.8	73	858	(9.1)	(0)	.55	.37	14.1	0
252.	Hominy		0	1,620	38.6	3.6	358.2	50	318	4.5	(0)	.68	.23	(4.3)	0
253.	Macaroni; spaghetti		0	1,636	59.0	6.4	335.5	100	654	5.4	(0)	.59	.36	9.5	0

NOTE: Asterisk indicates Army ration component; parentheses imputed value.

[39] Sulfured

[40] Unsulfured.

[41] Citric acid, dextrose, coloring, flavoring, ascorbic acid.

[42] Caloric value of organic acids included.

[43] Powdered lemon juice and corn sirup, dextrose, citric acid, oil of lemon, ascorbic acid.

[44] Powdered orange juice, lemon juice, and corn sirup, dextrose, citric acid. oil of orange, ascorbic acid.

[45] Whole-grain buckwheat flour has approximately 2.77 mg. thiamine; 0.75 mg. riboflavin; and 18.9 mg. niacin per pound.

TABLE LXVI (Continued)

Nutritive Value of One Pound of Selected Foods as Purchased

Food item	Nature of refuse	Refuse	Food energy	Protein	Fat	Carbo-hydrate	Calcium	Phos-phorus	Iron	Vitamin A value	Thia-mine	Ribo-flavin	Niacin	Ascorbic acid
GRAIN PRODUCTS—Continued														
Other cereals—Continued:		*Percent*	*Calories*	*Grams*	*Grams*	*Grams*	*Milli-grams*	*Milli-grams*	*Milli-grams*	*Inter-national Units*	*Milli-grams*	*Milli-grams*	*Milli-grams*	*Milli-grams*
254. Noodles		0	1,746	64.9	22.7	320.5	109	708	8.6	(890)	(.59)	(.54)	(9.5)	0
Rice:														
255. Brown		0	1,616	34.0	7.7	352.8	177	1,376	25.0	(0)	1.33	0.22	20.7	0
256. Converted		0	1,593	(34.5)	(1.4)	(360.5)	(41)	(418)	(3.2)	(0)	1.04	.18	17.2	0
257. White		0	1,593	34.5	1.4	360.5	41	418	3.2	(0)	.24	.12	6.3	0
258. Tapioca		0	1,588	2.7	.9	392.3	54	54	(4.5)	(0)	0	(0)	(0)	0
SUGARS, SWEETS														
259. Honey		0	1,449	1.4	0	360.9	23	73	4.1	(0)	.02	.17	1.0	16
260. Jams; marmalades		0	1,307	2.3	1.4	321.4	54	54	(1.4)	50	.07	.11	.7	26
261. Jellies		0	1,184	.9	0	295.1	(54)	(54)	(1.4)	(50)	(.07)	(.11)	(.7)	17
262. Molasses, cane		0	1,090	(0)	(0)	(272.4)	1,239	232	30.4	(0)	.36	.72	12.9	(0)
263. Sirup, table blends		0	1,344	(0)	(0)	(336.0)	209	73	18.6	0	0	.05	.5	(0)
264. Sugar, brown		0	1,734	(0)	(0)	(433.6)	[46] 345	[46] 168	11.8	(0)	(0)	(0)	(0)	(0)
265. Sugar, granulated or powdered		0	1,807	(0)	(0)	451.7	(0)	(0)	.5	(0)	(0)	(0)	(0)	0
MISCELLANEOUS														
266. *Bouillon cubes		0	1,175	80.4	0	213.4	182	2,315	41.8	(0)	.12	3.75	[47] 2.7	(0)
267. Chocolate, unsweetened		0	2,589	(25.0)	240.2	(81.7)	[48]	1,557	11.4	(0)	--------	1.09	5.0	(0)
268. Cocoa		0	1,495	(40.9)	85.4	(140.7)	[49]	3,219	12.3	(0)	--------	(1.77)	(10.4)	(0)
269. Coconut, dry, shredded		0	2,629	16.3	177.5	241.5	195	867	16.3	0	Trace	Trace	Trace	(0)
270. Gelatin dessert powder		0	1,782	42.7	0	402.7	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
271. Olives, green	Pits	21	516	5.4	48.5	14.4	363	54	7.2	1,500	Trace	--------	--------	--------
272. Pickles, cucumber		0	52	2.3	.9	8.6	109	100	4.1	870	.03	.11	.2	30
273. Wheat germ		0	1,765	114.4	45.4	224.7	381	4,976	36.8	(0)	9.31	3.63	20.7	(0)
274. Yeast, compressed, baker's		0	494	60.4	1.8	59.0	114	2,747	22.2	(0)	2.05	9.38	128.0	(0)
275. Yeast, dried, brewer's		0	1,582	209.3	7.3	169.8	481	8,594	82.6	(0)	43.99	24.72	164.2	(0)

NOTE: Asterisk indicates Army ration component; parentheses, imputed value.

[46] Based on dark brown sugar; lower values for light brown sugar.

[47] Based on vegetable extract type; meat extract type may have up to 123 mg. of niacin.

[48] 431 mg.; may not be available because of presence of oxalic acid.

[49] 726 mg.; may not be available because of presence of oxalic acid.

TABLE LXVII · *Recommended Daily Dietary Allowances*

Family members	Food energy	Protein	Calcium	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic acid	Vitamin D
Children up to 12 years:	*Cal.*	*Gms.*	*Gms.*	*Mg.*	*I. U.*	*Mg.*	*Mg.*	*Mg.*	*Mg.*	*I. U.*
Under 1 year	(2)	(3)	1.0	6	1,500	0.4	0.6	4	30	400
1–3 years (27 pounds)	1,200	40	1.0	7	2,000	.6	.9	6	35	400
4–6 years (42 pounds)	1,600	50	1.0	8	2,500	.8	1.2	8	50	400
7–9 years (58 pounds)	2,000	60	1.0	10	3,500	1.0	1.5	10	60	400
10–12 years (78 pounds)	2,500	70	1.2	12	4,500	1.2	1.8	12	75	400
Girls:										
13–15 years (108 pounds)	2,600	80	1.3	15	5,000	1.3	2.0	13	80	400
16–20 years (122 pounds)	2,400	75	1.0	15	5,000	1.2	1.8	12	80	400
Boys:										
13–15 years (108 pounds)	3,200	85	1.4	15	5,000	1.5	2.0	15	90	400
16–20 years (144 pounds)	3,800	100	1.4	15	6,000	1.7	2.5	17	100	400
Women (123 pounds):										
Sedentary	2,000	60	1.0	12	5,000	1.0	1.5	10	70	(4)
Moderately active	2,400	60	1.0	12	5,000	1.2	1.5	12	70	(4)
Very active	3,000	60	1.0	12	5,000	1.5	1.5	15	70	(4)
Pregnancy (latter half)	[5] 2,400	85	1.5	15	6,000	1.5	2.5	15	100	400
Lactation	3,000	100	2.0	15	8,000	1.5	3.0	15	150	400
Men (154 pounds):										
Sedentary	2,400	70	1.0	12	5,000	1.2	1.8	12	75	(4)
Physically active	3,000	70	1.0	12	5,000	1.5	1.8	15	75	(4)
With heavy work	4,500	70	1.0	12	5,000	1.8	1.8	18	75	(4)

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[1] Source: Recommended Dietary Allowances, National Research Council Reprint and Circular Series No. 129, revised 1948. This table is a goal, subject to revision, toward which to aim in planning practical dietaries. The recommended allowances can be attained with a good variety of common foods which will also provide other minerals and vitamins for which requirements are less well known. For further recommendations and explanations, see the National Research Council's publications.

[2] 110 calories/2.2 pounds (1 kg.) body weight at 6 months. (Energy requirements are 120 calories/2.2 pounds in early infancy and 100 calories/2.2 pounds at 1 year.)

[3] 3.5 grams/2.2 pounds (1 kg.) body weight.

[4] For persons who have no opportunity for exposure to sunshine and for elderly persons, the ingestion of small amounts of vitamin D may be desirable.

[5] The value of 2,400 calories represents the allowance for pregnant, sedentary women. If more active, additional calories may be needed.

Selected Films on Food Selection and Preparation

ARMOUR AND CO. (Chicago 9, Ill.)

Quicker Than You Think. 16 mm. sound motion picture, black and white, on how to prepare dinners in minutes rather than hours.

The Gentle Art of Meat Cookery. 16 mm. sound motion picture, black and white, on the hows and whys of meat cookery.

GENERAL MILLS, INC. (Minneapolis 15, Minn.)

400 Years in 4 Minutes. 16 mm. sound motion picture, color, giving the new Betty Crocker method of making cakes containing fat.

NATIONAL LIVE STOCK AND MEAT BOARD (407 S. Dearborn Street, Chicago 5, Ill.)

Cooking Meat by Dry Heat. 16 mm. slide film, color, on dry-heat methods of neat cookery.

Meat and Romance. 16 mm. sound motion picture on meat, its selection, cookery, and nutritive value.

The Way to a Man's Heart. 16 mm. sound motion picture, part in color, on nutrition and how to buy, cook, and serve meat, and on meat's proper place in the diet.

NATIONAL DAIRY COUNCIL (Chicago 6, Ill.)

A Guide to Good Eating. A sound motion picture, color, on nutrition.

America's Favorite. A sound motion picture, color, on the manufacture and nutritive value of ice cream.

More Life in Living. A sound motion picture, black and white, dramatizing the rewards of proper eating.

POULTRY AND EGG NATIONAL BOARD (308 W. Washington Street, Chicago, Ill.)

How to Cook Eggs. 16 mm. slide film, color, on methods of cooking eggs.

Nature's Defense Package. 16 mm. slide film, color, on the value of eggs in nutrition.

UNITED STATES DEPARTMENT OF THE INTERIOR (Fish and Wildlife Service, Chicago 54, Ill.)

Home Cookery of Fish. 16 mm. sound motion picture, black and white, on three methods of cooking fish—broiling, boiling, and baking.

SWIFT AND CO. (Chicago 9, Ill.)

Hidden Hunger. 16 mm. sound motion picture, black and white, on the advantages of eating properly.

Menus for Two[1]

SUNDAY

Grapefruit
Ready-to-eat cereal with
top milk
Fluffy omelet
Toast Table fat
Beverage

Roast chicken or shoulder of lamb
Mashed potatoes
Diced carrots and turnips
Celery
Biscuits Table fat
Cottage pudding Beverage

Waffles Table fat Sirup
Apple and celery salad
Milk

MONDAY

Orange juice
Hot cereal with top milk
Toasted biscuits
Table fat Beverage

Vegetable soup
Egg salad sandwich
Oatmeal cookies
Milk

Curried chicken or lamb with rice
Snap beans Cole slaw
Bread Table fat
Sweet-potato or pumpkin pie
Beverage

TUESDAY

Orange
Hot cereal with raisins
and top milk
Toast Table fat
Beverage

Green beans
with cheese sauce on toast
Sweet-potato
or pumpkin pie
Beverage

Beef loaf Baked potatoes
Cabbage Carrot sticks
Bread Table fat
Cottage pudding with hot jelly sauce
Milk

WEDNESDAY

Tomato juice
Scrambled eggs
Toast Table fat
Beverage

Boston baked beans
Apple and raisin salad
Corn bread Table fat
Milk

Lamb stew with potatoes, onions, turnips or Chicken a la king
Green peas Carrot salad
Bread Table fat
Cottage pudding with ice cream
Beverage

THURSDAY

Orange juice
Hot cereal with top milk
Toasted corn bread
Table fat Jelly
Beverage

Creamed peas
on toast
Carrot and apple salad
Cookies
Milk

Sliced beef loaf with tomato sauce
Lyonnaise potatoes Squash
Cole slaw Bread Table fat
Baked apple Milk

FRIDAY

Orange
Ready-to-eat cereal with top milk
Toast Table fat
Beverage

Baked beans and tomato sauce
Turnip sticks
Bread Table fat
Cookies Milk

Baked or broiled fish
Baked potato Broccoli
Carrot and raisin salad
Bread Table fat
Fruit in season Beverage

SATURDAY

Sliced orange
Hot cereal with top milk
Toast Table fat
Beverage

Cream of broccoli soup
Cheese and lettuce sandwich
Cookies
Beverage

Smothered liver and onions
Mashed potatoes Kale
Bread Table fat
Jellied fruit cup
Milk

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[1] United States Department of Agriculture, AIS 21, *Food for Two.*

Menus for Four[1]

SUNDAY

Orange juice
Scrambled eggs
Toast Table fat
Preserves
Milk for children[2]
Coffee or tea for grown-ups

Pot roast with carrots, potatoes, and onions
Chopped spinach
Bread Table fat
Two-egg sponge cake with ice cream
Milk for children[2]
Coffee or tea for grown-ups

Open-faced grilled cheese and bacon sandwich for grown-ups
Hot wheat cereal with milk for children
Shredded cabbage and raisin salad
Fruit in season Milk

MONDAY

Prunes with orange slices
Hot oatmeal with milk
Toast Table fat
Milk for children
Coffee or tea for grown-ups

Cream of tomato soup with toast squares
Shirred eggs Spinach
Bread Table fat
Baked Indian pudding Milk

Beef casserole with mounds of mashed potatoes (beef left from Sunday roast)
Green peas Fruit salad
Bread Table fat
Sponge cake with honey sauce Milk

TUESDAY

Grapefruit sections
Soft-cooked eggs
Toast Table fat
Milk for children
Coffee or tea for grown-ups

Baked macaroni Green beans
Shredded raw carrots
Bread Table fat
Oatmeal and prune pudding (oatmeal left from Monday breakfast)
Milk

Broiled liver or liver pattie Baked potato Baked squash
Tossed green salad flavored with chopped crisp bacon
Bread Table fat
Fruit in season Milk

WEDNESDAY

Orange
Ready-to-eat cereal with milk
Toast Table fat
Preserves
Milk for children
Coffee or tea for grown-ups

Split pea soup
Apple, cabbage, and raisin salad
Bread Table fat
Baked Indian pudding
Milk for children
Coffee or tea for grown-ups

Beef hash with potatoes (beef left from Sunday)
Home-made vegetable relish
Creamed carrots and peas Celery
Bread Table fat
Fruit cup Milk

THURSDAY

Tomato juice
Hot oatmeal with milk
Toast Table fat
Milk for children
Coffee or tea for grown-ups

Creamed eggs on toast or
Soft-cooked eggs with toast
Jellied fruit salad
Molasses cookies
Milk

Baked shoulder of lamb
Baked sweet potato Green lima beans
Cole slaw
Bread Table fat
Canned peaches Graham crackers Milk

FRIDAY

Orange
Hot wheat cereal with raisins and milk
Toast Table fat
Milk for children
Coffee or tea for grown-ups

Split pea soup
Cottage cheese and peach salad
Bread Table fat
Cookies
Milk for children
Coffee or tea for grown-ups

Baked fish (haddock, cod, or halibut)
Sliced beets Baked potato Celery
Bread Table fat
Lemon snow with custard sauce
Milk for children
Coffee or tea for grown-ups

SATURDAY

Tomato juice
Ready-to-eat cereal with milk
Toast Table fat Preserves
Milk for children
Coffee or tea for grown-ups

Peanut butter and celery sandwiches
Vegetable salad
Floating island or junket
Milk for children
Coffee or tea for grown-ups

Minced lamb on riced potatoes (lamb left from Thursday dinner)
Green beans Hearts of lettuce with dressing
Applesauce Graham crackers Milk

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[1] United States Department of Agriculture, AIS 59, *Food for the Family with Young Children.*

[2] A 6-ounce serving of milk is allowed for the children. If the children do not drink all their milk, they have it as part of the afternoon snack.

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